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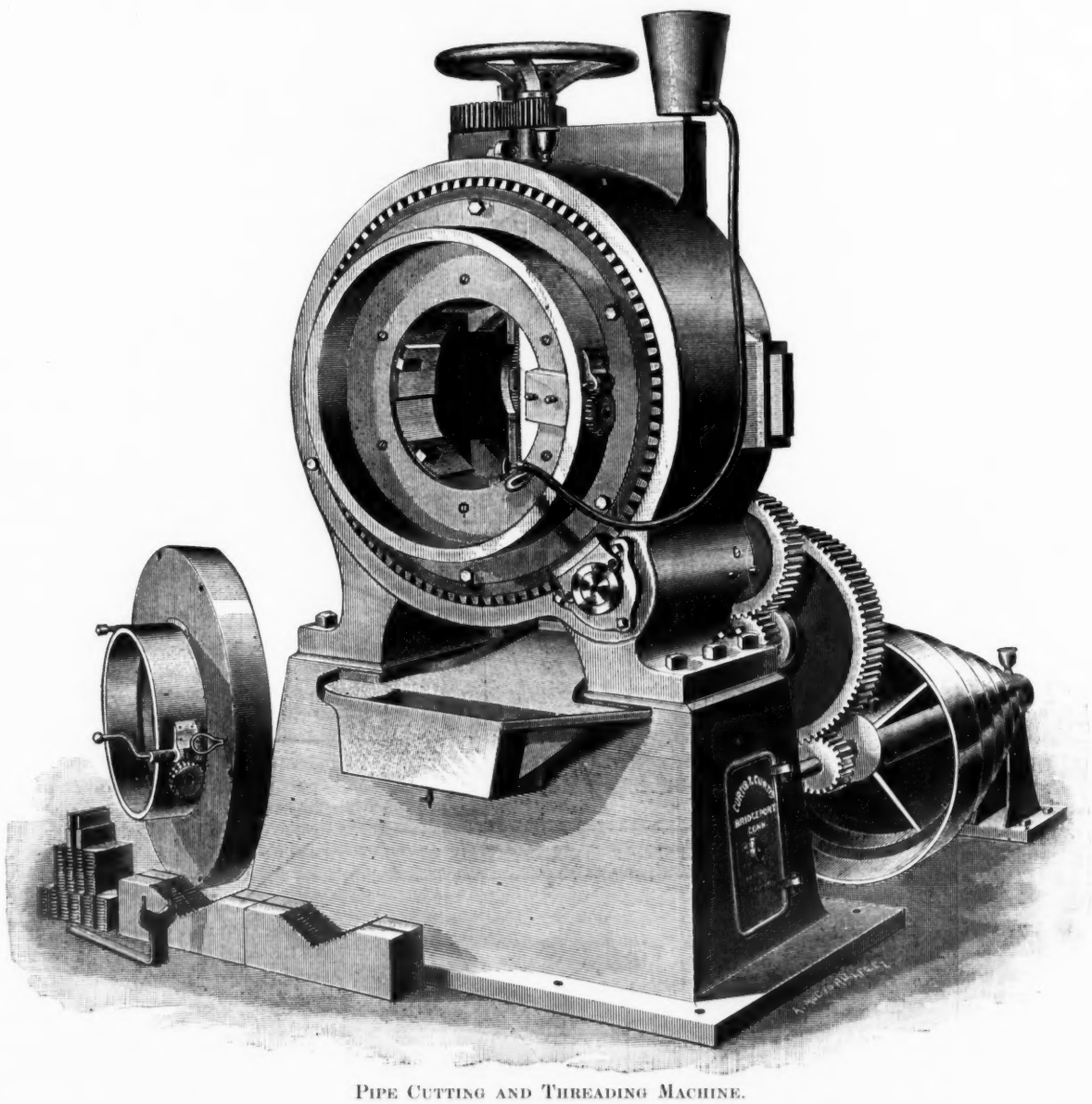
A New Pipe Cutting and Threading Machine.

Curtis & Curtis, of Bridgeport, Conn., have just placed on the market a new pipe cutting and threading machine, which we illustrate herewith. It is arranged to cut off and thread all sizes of wrought-iron pipe from 2½ to 12 inches inclusive—a range of sizes which is unusually great. The machine occupies a comparatively small floor space, and this enables long lengths of pipe to be handled in the smallest possible room. The general principle is the same as in the smaller sizes of pipe machine for hand or power made by this firm—a die carrying gear, supported in a casing or shell, with the pinion imbedded in its side. On the back of the gear is placed a lead screw, of the same number of threads to the inch as the pipe to be cut, which engages with the brass lead blocks, shown on the side of the shell, and which work out or in by eccentrics. Thus as the gear revolves in the shell it is drawn back into the casing by the lead screw, and the dies are brought onto the pipe. In operating the machine, the pipe is placed through the self-centering vise attached to the back of the machine, with the end to be cut against the back of the dies, and securely clamped by turning the hand-wheel shown on the top of the machine. The dies are all open and adjustable to any variation of the fittings, by means of cams behind the dies on an annular ring, and they are set for the size of pipe to be cut, by turning the ring to the corresponding graduation. The difficulties attending so great a range are overcome by using two die carrying rings, which fit into the large gear. The larger one is shown in the machine, and contains six dies for threading all sizes of pipe, from 7 to 12 inch inclusive. The smaller fixture is shown by the side of the machine, and contains four dies for cutting all sizes from 2½ to 6 inches inclusive. A change from 2½ to 12 inches is made in a few moments, by simply changing the fixture and the jaw steels.



PIPE CUTTING AND THREADING MACHINE.

The advantages claimed for this machine are that it has unusually large range, requires the minimum of floor room, takes little power to run it, and is very simple in construction.

Judging from the accounts received, the members of the Mechanical Engineers' Society have met with a very cordial reception in England, and are likely to be afforded every possible opportunity for enjoying themselves, as well as for obtaining valuable information.

Something for Pattern Makers.

BY P. S. DINGEY.

It is sometimes required to lay off an arc, the radius of which is given; but the radius may happen to be so great as to render it inconvenient to locate a center to strike the arc from—or the center may be inaccessible from various reasons; under these conditions the question arises what to do to get the arc. The following is by no means new, yet it is so little understood by pattern makers generally, that I think it worth while presenting. The all-important in this problem is to know how to get the point C, or the versed sine of arc in Fig. 1 (page 2)—this must be calculated before anything can be done toward striking the arc. Let us suppose the line $A\ B$ to be, say 4 ft., and to represent the chord of an arc whose radius is 20 ft; it is required to strike this arc without using the center. By using the following formula from Molesworth, the desired point can be obtained, $v = R - \sqrt{R^2 - (\frac{1}{2}c)^2}$. This formula need not scare the pattern maker who is not familiar with algebraical expressions; it is very simple; let us examine it. v is the versed sine, R the radius, c the chord. v is what we want to get. The formula means that the square of half the chord, which is 4 ft., must be deducted from the square of the radius, which is 400 ft.—this will give 396 ft., then extract the square root ($\sqrt{}$) of 396 ft., which is about 19.9; the formula is now reduced to $v = R - 19.9$, which means that 19.9 must be deducted from R the radius 20 ft.; this leaves $\frac{1}{10}$ of a foot; $\frac{1}{10}$ of a foot is 1.0167″, or, say, $1\frac{3}{16}$″+, which is the required versed sine.

Having obtained the versed sine of this arc, it is an easy matter now to strike the arc —it is done by cutting a piece of wood to an angle, two sides of which run from point C, and through $A\ B$; drive a wire nail at each point of A and B in the piece on which the arc is to be struck. It will be readily seen now, that, by keeping the sides of angle against $A\ B$, and moving it right and left, the arc can be traced by following with a lead pencil the point C. The principle of this is the same as many pattern makers are familiar with—that of using a square when working out a half-circle core-box.

HOW TO LAY OUT THE THREAD OF SCREW FOR THE PATTERN.

If the simplest way of doing anything be correct, it is always the best way. I propose to show next the simplest way that I know of for laying out the thread of a screw. Let us suppose a pattern for a worm pinion is to be made 4″ diameter, with a single right-hand thread 1″ pitch.

First turn the pattern—which should be in halves—to the diameter 4″, and to the required length, say 6″, and do not destroy the centers, because after the threads are cut the pattern can be returned to the lathe, and the threads sand-papered on a slow speed; a much better job can be done at sand-papering this way than otherwise. After turning the pattern, wrap a piece of paper around it, and cut to the exact length of circumference, and also the length of pattern. After doing this, take the paper off and lay it flat, as shown in Fig. 3. The full lines which are laid off parallel to each other, and 1″ apart, represent the center line of thread, or pitch. After making these lines, take the paper and wrap it around the pattern again, and it will be found that the end marked 1 will meet the one marked 2, and 4 will meet 3, and 5 will meet 6, and so on, thus making one continuous line when wrapped on pattern again; but, before gluing the paper to the pattern, mark the thickness of the thread. Be careful when you have a right-hand worm to make, that you do not make it left-hand by running the lines the wrong way; I have seen this done more than once. On one occasion the pattern was half finished; on another, finished, before it was noticed. If it is to be a right-hand thread, the lines should run down toward the left-hand, as seen in Fig. 3; if it is to be a left-hand they should run down toward the right.

When a double thread is required, instead of starting to draw the lines from the first division to the corner, start from the second, as shown by dotted lines in Fig. 3—this will give a double thread, and, in fact, any number of threads can be obtained this way. If the angle of the thread is increased twice, two threads are the result, if three times, three threads, and so on until the number of threads are so many, and the angle so great, that we cease to call it a worm, and begin to name it a spiral gear.

It will probably occur to some minds that, if glue be used to fasten this paper to the pattern, the moisture of the glue will stretch it so as to make the ends that meet lap over; this would make a slight difference in the pitch, but it would be so little that it would make no practical difference; but this can be avoided, and the ends need not be allowed to lap over, if a little care is exercised. Instead of spreading the glue over all the surface of the paper, put a little on the two ends that

join, and also here and there on the surface; then lay the paper flat and roll the pattern carefully on it, the pattern gathering up the paper around it as it is rolled. Of course these are minor details, but if a spiral gear is to be laid out this way—and it can be—the two ends of the paper should meet exactly.

Details of Sweet's 16-Inch Engine Lathe.

BY PROF. C. I. KING.

III.

The transverse section *A B*, Fig. 16, which is between the gear train and reversing cam, shows the method of attaching the hand lever to the device. The steel cylinder *C* has the projecting arm *A*, which terminates in the hub *h*, in which the grooved half ring *p* is placed. A hole is drilled through *C*, which fits a pin shown in dotted outline at *P*, Fig. 16, and *P'*, Fig. 17; also previously shown at *P*, Fig. 13. A second pin, perpendicular to the axis of *C*, receives the handle *H*, and allows it to be raised over and lowered into the notches *N*, Figs. 16 and 17. The bevel gear *G*, Fig. 16, is that one previously described as having a square hole in it, and receives a similar wheel on either side of it. In Fig. 18 we have a longitudinal section through the end of the screw, and a part section of the wheels *W*, with which they work. In Fig. 19 a transverse section *C D* shows the method of fixing an invariable relation between the wheels themselves and the screw. Three fixed keys are placed—one in the screw, one in the hub of the next wheel, and one in the second wheel; each of the gears 1, 2 and 3 will slide endwise on its key. Owing to the dish-shape of 2 and 3, they will all slide together, so that the edges of their rims are in the same plane. The pin *P* is fitted to a hole in the end of the screw, but has an inclined plane milled at its inner end. On this plane three round pins *p'''* rest. They are placed in holes drilled, one each in the hubs of the No. 2 and 3 gears, and one on the screw. When in the position shown, the withdrawing of pin *p'''* will force them out, and, of course, hold No. 1 tightly in place. To prevent more than one of these gears getting in mesh at the same time, a very neat arrangement is provided, which, for simplicity, cannot be easily excelled. Two small rims, conical at each end, is nearly all there is of it. They are shown in position at *p'* and *p''* at Fig. 18. In length they are equal to the thickness of the hubs of the wheels 2 and 3, plus the height of one of the cones. This excess of length is provided for by countersinks *c c c c*, drilled on the inside of the hubs of each wheel, and also on the outside of the screw. It will be seen that the pin *p''* is shown in the countersink of the screw, and that wheel No. 3 cannot be moved endwise. Also that No. 2 is held in the same way by pin *p'*, but by pushing in pin *P*, No. 1 gear can be moved until its countersink is under *p'*; then any effort to move No. 2 will force the pin out, and No. 2 can be put in place, and No. 1 cannot be moved again until No. 2 is brought back. No. 3 can be moved by the same method. A section of the main journal box for the screw and of the thrust collar is shown in this figure at *B*. A short hub *H'* is on the back side of gear No. 3, into which the end of box projects far enough that the screw is not uncovered when the gear is in use, and is thereby protected from dust

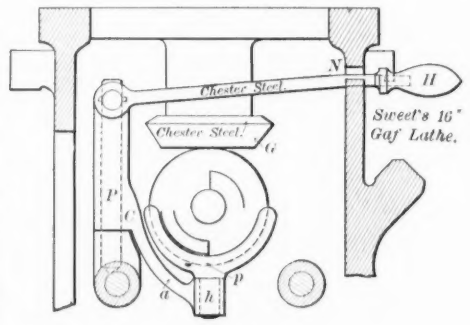


Fig. 16

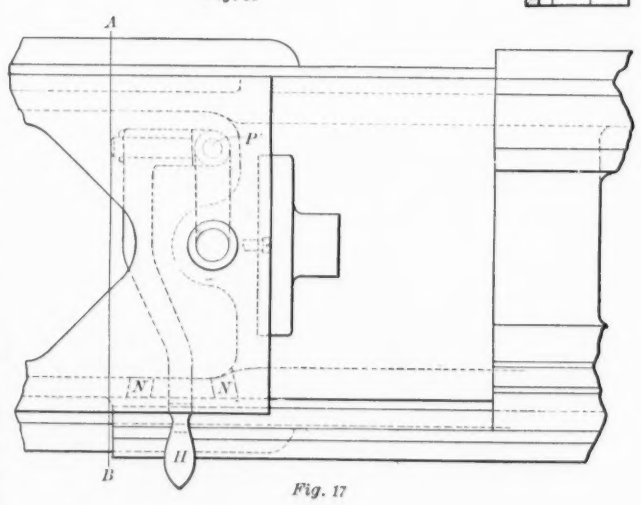


Fig. 17

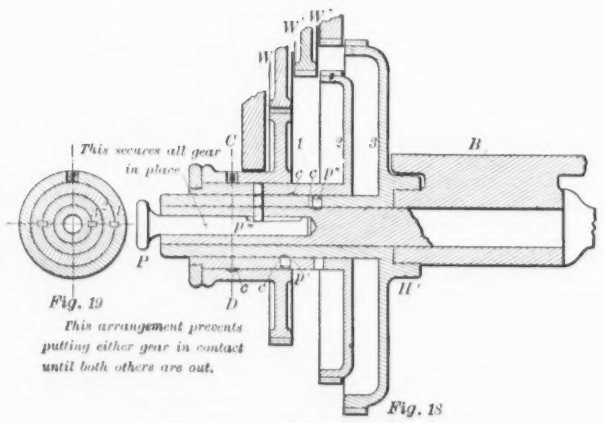


Fig. 19 Fig. 18

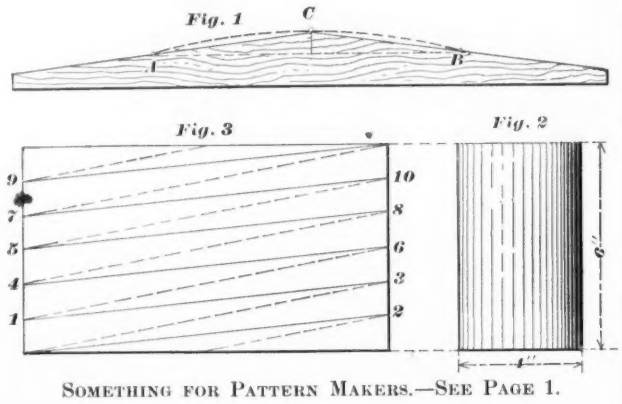
DETAILS OF 16-INCH LATHE.

How I Got There.

BY GEO. GUNTZ.

This means that I conveyed steam twenty-five hundred feet with a loss of only one and a half pounds pressure, after taking from the line of pipe four connections to supply four other engines and a heating coil.

About a year and a half ago my services were called into requisition to make plans for a new packing house for a powder mill. You know how a powder mill is arranged? Oh, you don't! Well, I will tell you how this particular mill was. In the ordinary mill the ingredients are mixed and ground at the same time, and in the same machine, then pressed and grained in two different machines, and then dried and glazed in another machine, making four machines to six processes; but in this mill all these processes were performed in independent machines; so for this reason, and the axiom that for safety it is a good policy to keep fire from powder as far as possible, and scatter your buildings over as much ground as circumstances permit, our boilers were at one end of the system, while the whole stretched out twenty-five hundred feet.



SOMETHING FOR PATTERN MAKERS.—SEE PAGE 1.

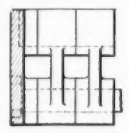
Of the processes in this mill, first comes the mixing, then the grinding, pressing, graining, drying, glazing and packing, in the order named. In the mixing and grinding process there is not much danger of an explosion, as the material is usually very wet; and in this mill some of the grinding mills are not more than twenty-five feet from the boiler house, but the press is over one hundred feet away, the dry house is seven hundred, the first glazing or packing house is thirteen hundred, the second, third and fourth are each four hundred feet apart, making the last twenty-five hundred feet from the boiler house.

The press is run by a 15x30-inch engine. So far the plant was to be left in its original place and condition, the old glazing and packing department was in one building (which usually contained ten tons of dry powder undergoing the process of glazing), the dry house in another building, each run by an engine supplied with steam from a set of boilers about four hundred feet away; but it became necessary to change the location of these buildings, on account of a new railroad running too close to them, and since new buildings, as well as new machinery, had to be built, it became desirable to lessen the danger from fire by removing these two departments further from the boilers; in fact, putting the boilers all in one house, and also to reduce danger to the whole system by dividing the glazing department into four buildings, instead of one.

Each of these buildings was supplied with machinery, and an engine to run it.

In the dry house—which made the fifth building—I put an 8x10 automatic engine, and in each of the packing houses a 7x8 engine of the same make.

I started from the boilers with a six-inch pipe, and ran seven hundred feet to the dry house; into this pipe I put five sleeve expansion joints, each taking the expansion of one hundred feet of pipe, and the remaining two hundred feet was taken up by four bends.



I built a stone pier about the middle of each hundred feet length, between the expansion joints. In four of these were built anchor bolts, and the pipe was clamped to these piers and held rigid, so that the pipe could expand longitudinally in both directions from the pier, and the ends move in and out of the expansion sleeves. Under the dry house floor I put a receiver 30 inches by 10 feet; this also clamped rigidly to a stone foundation; the six-inch pipe connected to one end, and out of the side I took the supply pipe for the engine and heater, and to the other end was connected a five-inch pipe, six hundred feet long—(I also connected a trap to these receivers, to take condensation, which I did propose to return to the boilers, but this part of the scheme was not carried out)—to the first packing house, where was placed a receiver twenty-four inches by nine feet, with similar connections, then a four-and-a-half-inch pipe four hundred feet long carried the steam to the second packing house, to a receiver 24 in. by 8 ft., thence by a 4-inch pipe four hundred feet long to the third packing house to a 24 inch by 7 ft. receiver, and with a 3-inch pipe four hundred feet long to the last packing house, with a similar receiver, all connected the same as first. The pipes and receivers were covered with asbestos cement, and when steam was turned on, and everything got warmed up, and the steam in the boiler had reached its normal pressure—60 pounds—the gauge on the last receiver showed 58½ pounds.

We started the five engines, and in a run of 2½ hours there was a fall of only one-half pound pressure at starting, which condition held about seven minutes. Before these changes were made it required eleven cylinder and one tubular boilers to run the plant; after they were made, it required only nine cylinder boilers.

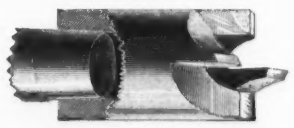
Literary Notes.

A HISTORY OF THE PLANING MILL. With Practical Suggestions for the Construction, Care and Management of Wood-working Machinery. By C. R. Tompkins, M. E. New York: John Wiley & Sons, 15 Astor place.

There is but little literature on the subjects treated in this book, and those whose work lies in the line of wood-working machinery will no doubt welcome this little book. The author gives an account of the invention of the planing machine, and deals with its construction and management in a clear, logical, and very readable manner. The book is full of good advice and practical hints. The price is $1.50.

PROFIT-SHARING BETWEEN EMPLOYER AND EMPLOYE. *A Study in the Evolution of the Wages System.* By Nicholas Pain Gilman. New York and Boston: Houghton, Mifflin & Co.

This is probably the most comprehensive and complete work which has yet appeared upon this subject. The accounts given of what has been done and is being done in the way of profit-sharing in many lines of industry, together with the historical treatment of the subject, being of value to all who are interested in the subject. The fact is prominently brought out, that profit-sharing is no new or rare thing, as it is popularly supposed to be, but has been practiced in this and other countries for many years; being especially common in the more simple occupations in which the labor of men is applied directly to the resources of nature—such as in the whale and other fisheries, and in farming. A large amount of information has been collated, and in many cases the experience of those who have tried profit-sharing is given in their own words, and with the results, figures and percentages. While all will probably not fully agree with the author in what he seems to expect would result from the general adoption of profit-sharing, yet no one will deny that he has made out a strong case in favor of the plan; and we think the book well worthy of perusal by all employers of labor, those who perform labor, and others interested in the solution of the problem relating to labor. It is published by Houghton, Mifflin & Co., Boston and New York.



Robbins' Hollow Mills.

Though hollow mills have been used quite generally in some lines of manufacture for years, there are a great many shops in which nothing is known of them, and they are now—for the first time, we believe—placed regularly upon the market in the form which we illustrate herewith. They are made in three sizes—⅝", ¾" and 1½" diameter outside, and milling sizes from ⅛" to ¼" by 64ths, and from ¼" to ⅝" by 32nds. Besides being so made that they can be held in a "hollow mill holder," as in screw-machine work, they are reamed to a standard taper at the back end to receive a plug, which may be fitted to a turret collar or chuck, or to the spindle of a drill press, or other tool. They are "relieved" or given clearance inside, and are so milled that the cutting edges can be ground back from ⅛" to ⅛". The maker, Ernest F. Robbins, of Needham, Mass., states that he makes them of first quality steel, and takes pains to temper them in the best manner.

Practical Drawing.

BY J. G. A. MEYER.

SEVENTY-NINTH PAPER.

575. Since in the general plan of any structure we must not only show the correct form of the separate parts which enter it, but must also show the true relative position of one part to another, and if one of these parts happens to have the form of a right pyramid with a hexagonal base, it may be necessary to represent this part as shown in Fig. 483*a*. It will now be advantageous to examine this figure more closely, and thus bring out points which may be overlooked, and which, if not thoroughly understood, may retard progress.

576. It has just been intimated that Fig. 483*a* represents a right pyramid with a hexagonal base; assume now that this figure has been correctly drawn, and that we have also a correct plan (Fig. 483) of this pyramid; and further assume, that we have at hand the pyramid here represented. In comparing the pyramid with its vertical projection, Fig. 483*a*, we will find that not one of the lines in this figure shows the correct length of any one of the edges of the pyramid; for instance, the lines $v\ a$, $v\ b$, $v\ c$ are shorter than the lateral edges, and the lines $a\ b$, $b\ c$ are shorter than the sides of the base. But these facts do in no way impair the value of geometrical drawing; for instance, although the lines $v\ a$ and $v\ c$ do not show the correct length of the lateral edges, these lines do show the correct slant height; and the distance from the vertex v to the point b does show the correct altitude; again, although the lines $a\ b$ and $b\ c$ do not show the correct lengths of the sides of the base, the distance, between the points a and c does show the correct distance between two parallel sides of the base, and furthermore, the line $a\ c$ shows us that the base of the pyramid is parallel to the horizontal plane of projection, and therefore we will find the correct lengths of the sides of the base given in the horizontal projection or plan, Fig. 483.

577. If the base of the pyramid had not been parallel to the horizontal plane of projection, but still remained perpendicular to the vertical plane of projection, the base could not have been represented by a horizontal line, but would have been represented by an oblique line. And if the base had not been perpendicular to the vertical plane of projection then it could not have been shown by a straight line, but would have been represented by a polygon, as shown, for instance, in Fig. 484. Notice the difference between Fig. 484 and Fig. 483*a*.

578. If now it is desirable to know the correct length of the lateral edges of the right pyramid shown in Fig. 483*a*, we have only to draw, in Fig. 483, a horizontal line $v_2\ g_2$; from v_2 as a center, and with a radius equal to $v_2\ a_2$, describe an arc, cutting $v_2\ g_2$ in the point g_2; and through this latter point draw a vertical line cutting the plane of the base in the point g, and join the points $v\ g$ by a straight line; then the line $v\ g$ will be the correct length of any one of the lateral edges. It will be noticed that, in finding the correct length $v\ g$ of the lateral edges, we have followed the instructions given in Problem 84. If now we have a complete drawing of the pyramid, such as is shown in Figs. 483 and 483*a*, we see at once every dimension of the pyramid.

579. There is another fact which we must keep in mind in making a working drawing, namely, at least two views of an object are necessary in order to show its complete form. See Art. 209. If, for instance, we have only an elevation, such as is shown in Fig. 483*a*, and no plan, we could not determine the kind of pyramid which this figure alone represents, because its outline being similar to that shown in the elevation Fig. 473, it may be a right pyramid with a square base; or it may not be a right pyramid, and may be an elevation of a pyramid, such as is represented in Figs. 485 and 485*a*.

580. Let us now briefly consider the projections shown in Figs. 485 and 485*a*. The pyramid represented here is not a right pyramid, because its base (Fig. 485) is not a regular polygon; that is to say, the sides of the base are not equal each to each. The lines $v_2\ a_2$ and $v_2\ b_2$, $v_2\ c_2$, etc., are the horizontal projections of the lateral edges, and because the lines $v_2\ b_2$ and $v_2\ e_2$ are longer than the lines $v_2\ a_2$, $v_2\ f_2$, $v_2\ c_2$ and $v_2\ d_2$ the edges which the former lines represent are longer than the edges represented by the latter lines. To find the correct length of the lateral edges we have only to follow the instructions given in Problem 84, and thus obtain in Fig. 485*a* the lines $v\ g$ and $v\ h$; the latter line represents the lengths of the two long lateral edges, and the line $v\ g$ represents the lengths of the four short lateral edges.

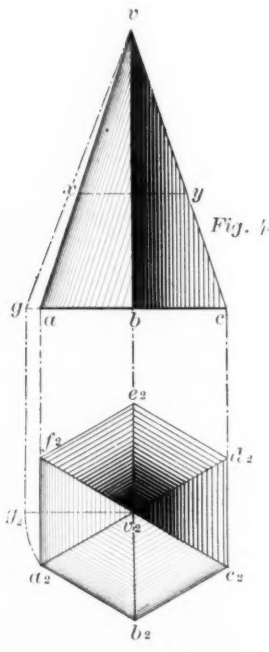


Fig. 483

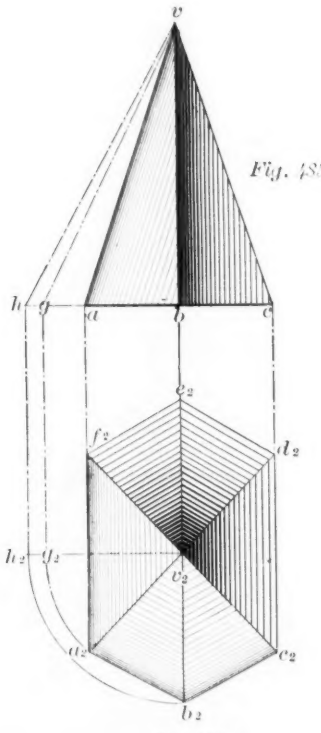


Fig. 485

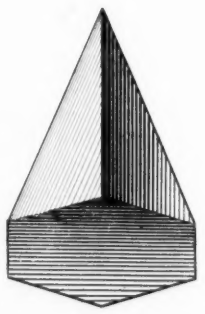


Fig. 484

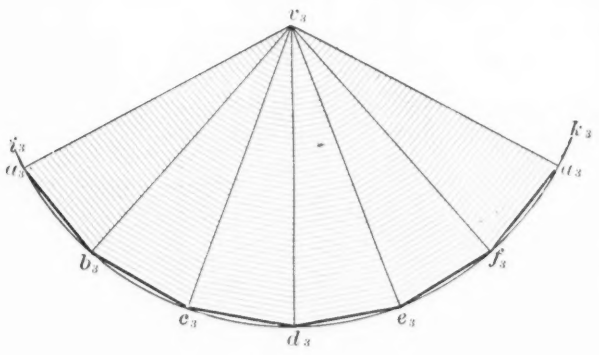


Fig. 486

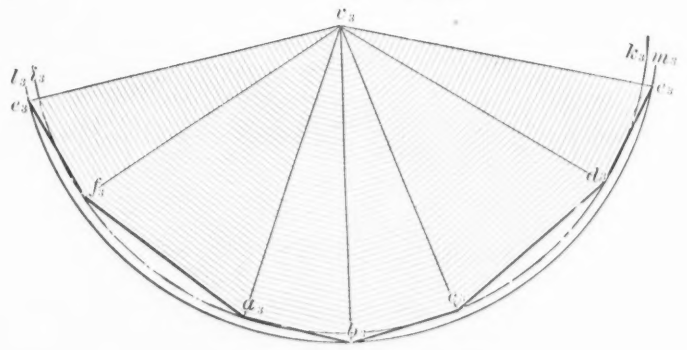


Fig. 487

PRACTICAL DRAWING.

Problem 86.

581. *Development of the lateral or convex surface of a right pyramid.*

Let Figs. 483*a* and 483 be the vertical and horizontal projections of right pyramid with an hexagonal base; it is required to find the development of the lateral or convex surface.

In all problems which require the developments of the surface of a pyramid, the correct length of the lateral edges must be known; hence, if we had not already found the length $v\ g$ of the lateral edges, our first step would be to find this length.

Fig. 486. From any point v_3 as a center, and with a radius equal to $v\ g$ (Fig. 483*a*), describe an arc $i_3\ d_3\ k_3$, any length, or rather of such length as will appear to be amply long enough. The point v_3 will be that point in the development from which all the lines representing the lateral edges are drawn, and since all the lateral edges are of equal length, and since the radius of the arc is by construction equal to the length of these edges, it follows that all the lines drawn from the point v_3 must terminate in the arc $i_3\ d_3\ k_3$.

From the point v_3, draw the line $v_3\ a_3$, and from the point a_3 lay off in succession on the arc $i_3\ d_3\ k_3$ the points b_3, c_3, d_3, etc.; the distance between any two adjacent points, for instance from a_3 to b_3, or from b_3 to c_3, must be equal to the length of one of the sides, as $a_2\ b_2$ of the base in Fig. 483. Join the points a_3 and b_3, b_3 and c_3, and so on, by straight lines; also, from v_4 draw straight lines terminating in the points a_3, b_3, c_3, etc., and thus complete the outline of the shaded surface, which is the development required.

Directions.—In space marked 86, find the development of the lateral or convex surface of a right pyramid whose base is 4 inches square; altitude, 7 inches. Use 3 inch scale.

For the sake of neatness, it is advisable to have the central edge in the development in a vertical position, consequently, instead of commencing with $v_3\ a_3$ in Fig. 486, commence by drawing the vertical line $v_3\ d_3$, then lay off on each side of $v_3\ d_3$ the required number of spaces, and complete the development as before.

582. In all examples of this kind, it will be advantageous to the student to cut out paper patterns. This can be satisfactorily accomplished by drawing the development full size on stiff paper; then cut out the development and bend it to the lines which represent the lateral edges, and thus form the pyramid.

Problem 87.

583. *Development of Surfaces.*

Let Figs. 485*a*, 485 be the vertical and horizontal projections of the pyramid; it is required to find the development of the convex surface.

Fig. 487. From any point v_3, and with a radius equal to the line $v\ g$ (Fig. 485*a*) describe an arc $i_3\ a_3\ k_3$; the point v_3 will be that point from which all the lines representing the lateral edges of the pyramid in the development are to be drawn, and since the radius of the arc $i_3\ a_3\ k_3$ is equal to the length of the short lateral edges of pyramid, these short edges must terminate in the arc $i_3\ a_3\ k_3$. Again, from the point v_3 as a center, and with a radius equal to the line $v\ h$ (Fig. 485*a*), describe the arc $l_3\ b_3\ m_3$; all the long lateral edges will terminate in this arc.

Through the point v_3 draw a straight line $v_3\ b_3$, terminating in the arc $l_3\ b_3\ m_3$; this line will then represent one of the long lateral edges, say it represents that edge which in Fig. 485 is represented by the line $v_2\ b_2$. Now notice in Fig. 485 the lines $v_2\ a_2$ and $v_2\ c_2$ represent edges adjacent to edge $v_2\ b_2$; the former are short edges, and terminate in the base at a distance from b_2 equal to the sides $b_2\ a_2$ and $b_2\ c_2$, and these distances are equal to each other; hence (Fig. 487) from the point b_3 as a center, and with a radius equal to $a_2\ b_2$, describe two short arcs, cutting the arc $i_3\ a_3\ k_3$ in the points a_3 and c_3; join the points b_3 and a_3, also b_3 and c_3 by straight lines. Again, notice in Fig. 485 that the edge $f_2\ e_2$ adjacent to $v_2\ a_2$ is another short edge, and the distance between the extremities of these edges in the base is equal to $a_2\ f_2$; hence, in Fig. 487 describe from the point a_3 and with a radius equal to $a_2\ f_2$ a short arc, cutting the arc $i_3\ a_3\ k_3$ in the point f_3, join the points a_3 and f_3 by a straight line. The edge adjacent to $v_2\ f_2$ in Fig. 485 is represented by the line $v_2\ e_2$, and, as will be seen, is a long edge; hence, from the point f_3 as a center, and with a radius equal to $f_2\ e_2$, describe an arc, cutting the arc $l_3\ b_3\ m_3$ in the point e_3; join the points f_3 and e_3 by a straight line. In a similar way find the points d_3 and c_3, join them by straight lines; also from point v_3 draw straight lines, terminating in the points c_3, f_3, a_3, etc., and thus complete the outline of the shaded surface, which is the required development of the convex surface of the pyramid represented in Figs. 485 and 485*a*.

Directions.—In the space marked 87, find the development of a pyramid whose altitude is 6½ inches; the distance between the sides $f_2\ a_2$ and $d_2\ c_2$ of the base (Fig. 485) is 4 inches, and the distance between the corners b_2 and e_2 is 7 inches; the base is perpendicular to the axis. Use 3-inch scale. Cut out a paper pattern, and thus test the accuracy of the work.

In reply to our editorial note on the demand for better stamping of letters by the post offices, a friend sends us an account of a machine used for the purpose in the Boston office. He sends also a sample of the work, which shows the familiar six parallel lines reaching across the top of the envelope nearly its entire length. The machine is said to be very effective, and the work it does is far superior to the ordinary hand stamping, as every one who receives letters from Boston knows. The name of the office, the date and the hour of the departure of the mail can actually be read, and the machine is said to greatly facilitate the handling of the letters in the office. We hope it will be adopted in every office in the country.

What has formerly been the *Mechanical and Milling News*, of Toronto, Canada, comes to us this month with its title enlarged by the addition of the word electrical, being now the *Electrical, Mechanical and Milling News*—a good deal of a name to be burdened with, but the *E., M. and M. N.* seems able to bear it.

Some Fixtures for Hand Lathes.

From the advance sheets of a pamphlet entitled, "The Construction and Use of the Universal Hand Lathe," published by the Brown & Sharpe Mfg. Co., Providence, R. I., we select the accompanying cuts for presentation to our readers, with the belief that they will prove interesting to the very large proportion of mechanics and manufacturers who make use of the hand lathe. The cuts are numbered as we find them in the book, from which we take the following description:

"Fig. 10 shows a method of centering needle bars, foot bars, shafts, etc., for sewing machine or similar work.

"The drill *A* is fastened in the drill holder *B*, which is secured in the tool holder *k*. The tool holder slides on the guides *j*, *j*, and the outer end of the drill holder slides upon the tool rest *p*. The shaft *X*, to be centered, is held in a shell chuck *m*, while the drill is pressed against it by hand, the palm bearing on a wooden cap *C*, which is slipped over the end of the tool holder. The pin *D*, in the drill holder *B*, serves as a stop in connection with the end of the shaft, and determines the depth of the hole."

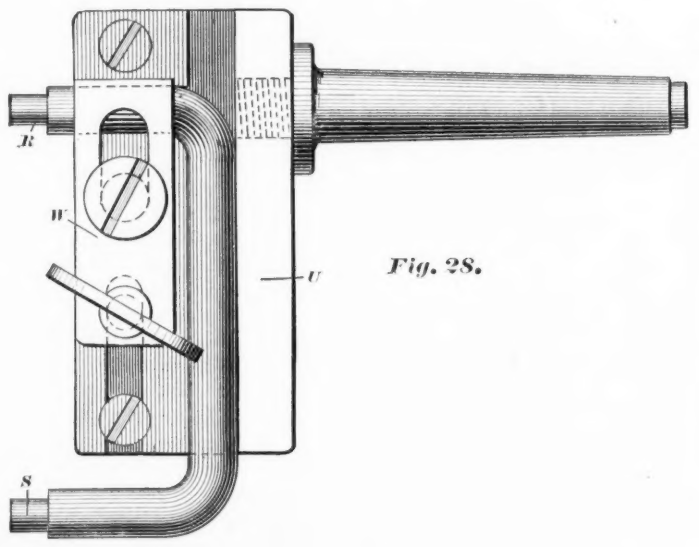


Fig. 28.

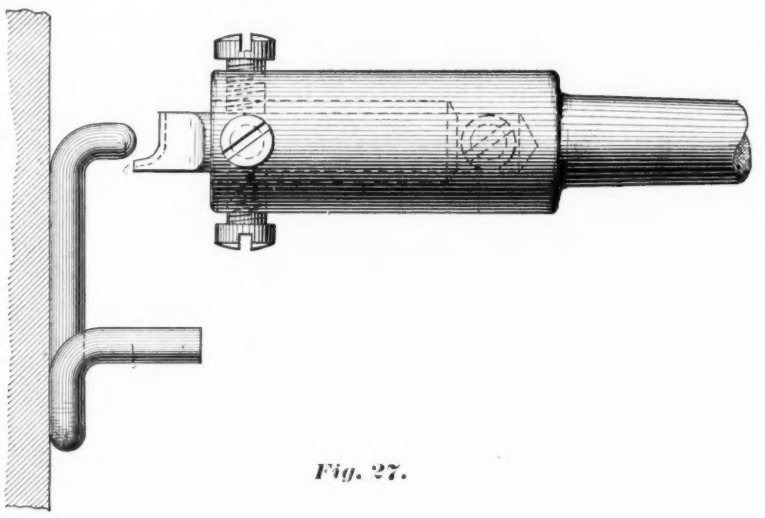


Fig. 27.

It is proper to add here that the tool holder *k* is used for a large variety of purposes by the insertion of variously shaped tools in the square holes of the bars, by means of which a number of operations are performed at one chucking of the piece operated upon. This tool has long been used among clock makers, and some few others, but is far less understood and appreciated among mechanics generally than its merits deserve.

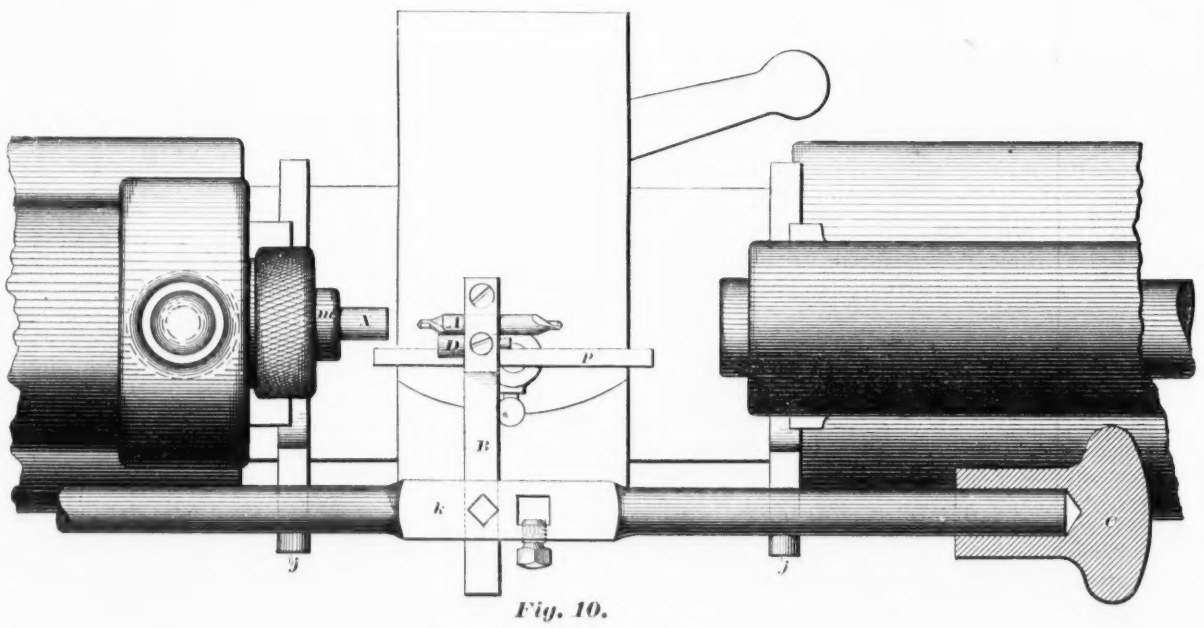


Fig. 10.

FIXTURES FOR HAND LATHES.

It consists essentially of the bar *k*, the ends of which are turned true, and of the same diameter, resting upon the supports *j j*, one of which is attached to the head-stock, and the other to the foot-stock; these are adjustable, so that the bar *k* can be held at any distance from the centers, and parallel to them, or at an angle for tapered work. The tool which ordinarily takes the place of the holder *B* rests upon the T-rest *P*, and is moved along by hand, the bar *k* sliding in rectangular notches provided in *j j*.

The head *c* serves to handle it by, and suitable stops may be attached to *k*, which, coming in contact with *j*, gauge the distance of shoulders from given points.

In finishing a pin, *I*, Figs. 15 and 16 [page 5] we use a special chuck, which grips the body and closes about the thread of the pin just enough to steady and hold it in line. The pin could not be held by the thread alone without damage, and the body is too short to admit of its being held by that alone. To use an ordinary chuck for such work would be comparatively slow and costly.

The foot-stock spindle of this lathe is operated by a lever, and Fig. 26 shows a method for forcing a circular disk or cutter on and off an arbor.

The arbor *H* is screwed into a cap *G*, which is screwed on the chuck thread of the live spindle. A hollow center *K* is placed in the dead spindle, and the disk is forced on the arbor with the hand lever. When finished it is forced off by the knurled nut *J*. With small disks or washers the arbor is not screwed into a cap *G*, but is held in a shell chuck.

The ends of a great many odd-shaped pins are rounded as at *M*, Fig. 27.

This cannot be done with the arrangement of tools before described, on account of the projecting part *L*; accordingly, the tool is held in a collet, which is inserted in the foot-stock spindle. The work is held on a face plate, and the end *M* located centrally by a clamp and stop pins. The length of *M* is regulated by adjusting the stop and stop screw, which limit the forward movement of the foot-stock spindle.

The four screws *Q* are used to adjust the tool when it is worn or ground.

Sometimes it is more convenient that the tool should be held in the live spindle, and the work secured to the dead spindle, as in turning the shoulders *R* and *S*, Fig. 28. The piece is held by the clamp *W* in a groove on a special fixture *U*, and is moved to the hollow mill, Fig. 29, [cut not shown] by the hand lever.

Sometimes, in order to turn out duplicate parts with rapidity, or to render the lathe available for work that would otherwise require a comparatively large and costly machine, it is of advantage to use a special and rather expensive fixture, as, for example, that shown in Fig. 39. The work to be done in this case is to turn a small groove *F*, in the hub of the handle *G*, and to do this work in the ordinary way, by swinging the handle on a face plate, would not only be much less rapid, but would require a lathe that would swing 18 inches over the bed.

On the hand lathe the fixture is screwed to the live spindle, and rotates with it while the piece operated upon is stationary. The cutting tool *I*, which turns the groove, is secured in the tool holder *J*. This tool holder is free to oscillate upon the pin *K*, and is fastened by this pin to the sleeve *L*, which is fitted on the stud or arbor *M*.

This sleeve is free to slide endwise on the arbor, but is prevented from turning by the pin *O*, which is fastened in *M* and projects through a slot on each side of the sleeve. The spring *P* continually presses the sleeve outwards against the pin *O*. A flat spring, *Q*, holds the back end of the tool holder *J* against the inclined surface *R*. *S* is a hardened steel bushing fastened to the sleeve *L*, and fitting freely to the hub *H*. The center *U* in the foot spindle terminates in a pin fitting the hole through the hub *H*.

In the operation of this device, the work or lever *G* is held in the left hand, and after it is placed on the center pin *U* as shown, it is brought up with the right hand by means of the hand lever, until the shoulder *T* bears on the bushing *S*, the hub *H* entering the same; then by pressing hard enough to overcome the force of the spring *P*, the sleeve *L* slides back on the arbor *M*. This motion causes the back end of the tool holder *J* to slide up the inclined surface *R*, which gradually feeds or moves the tool *I* towards the center and places it in position to remove the stock and form the groove. The depth of the groove is regulated by the adjustment of foot spindle stop. As the pressure on the bushing *S* and sleeve *L* is released, the work *G* may be simultaneously withdrawn, since the springs *P* and *Q* at the same time adjust the parts to the relative position shown in Fig. 39, the tool *I* being out of the way to let the hub *H* pass out. The time consumed in doing this work is simply the time required to pick up the handle *G* from the bench or shelf, place it on the center pin *U*, press it against the fixture and then withdraw it.

It is said that by holding lead pencil writing over steam until it is quite damp, it is rendered durable, and will not blur afterwards.

English Boiler Inspection.

BY W. H. BOOTH.

Many years ago, when Fairbairn conducted so many experiments on the strength of iron structures generally, the proportions of riveted joints did not escape his attention, and he laid down several rules on the strength of boilers, which have, with such modifications as have been from time to time found necessary or advisable, formed the basis of most of the present rules for boiler strengths.

Fairbairn assumed the strength of solid plate to be 100, and on this basis stated that of a double-riveted seam as 70 and that of a single-riveted seam as 56. These proportions are very generally accurate and still worked to, though it is no doubt true that a greater proportion than 70 per cent. of the strength of solid plate may be obtained by a well-designed, double-riveted joint. It is a matter of general observation that, when a boiler bursts, the riveted seams give way almost invariably by tearing of the plates through the rivet holes, and this goes to prove that such seams are usually misproportioned and much over-riveted. Practical boiler makers, however, will tell us that, with the wide pitches called for in a balanced seam, there is a difficulty in securing tight work, and therefore an excess of rivets is necessary. With the customary proportions of joints, therefore, the above percentages have been very generally accepted as sufficiently accurate for daily work, and as a standard from which to estimate the strength of any boiler, it became an accepted fact that a double-riveted iron boiler by a good maker, and having a diameter of seven feet, might be considered to be working safely at a pressure of 75 pounds, if made from plate $\frac{7}{16}$" thick. In other words, a seven-foot diameter boiler would be allowed a pressure of ten pounds for each $\frac{1}{16}$ of plate thickness, together with an additional five pounds for good workmanship. The iron of which such a boiler would be supposed made, would have a tensile strength of 20 tons or 44,800, or practically 45,000 pounds, and the working stress of the solid plate would be therefore 7,200 pounds per square inch. The stress in the material of the seam would, however, be $\frac{100}{70}$ of this, or 10,300 pounds. The boiler, therefore, is supposed to have a factor of safety of about $4\frac{1}{2}$, and to be so constructed and strengthened at such points as manhole openings, that these are as strong as the riveted seams at least. Such a boiler would have drilled rivet holes, and it will strike an American engineer that the allowed pressure is very low, as to which we shall say more anon.

For steel, considerably greater pressures are allowed; probably from 25 to 30 per cent. more as a rule. One of the leading makers in Lancashire, who was perhaps the first to enter almost entirely into the making of all steel boilers, allows a working stress of 6 tons, or 13,440 pounds, per square inch of solid plate. He adopts the 70 per cent. rule for double-riveted seams, and so actually works on a basis of 9,400 pounds per square inch of plate section, and in single-riveted joints of 7,500 pounds. Working out on this basis, the plate thickness of the 7-foot standard boiler at 75 pounds pressure, we find this to be .335, or something less than $\frac{3}{8}$. The steel thus allowed a strength of 13,440 pounds on the net section, would be supposed to have an ultimate resistance of 26 tons, or 58,240 pounds. Within the last few years, however, the ductility and reliability of steel boiler plate has been largely improved, and good, reliable plates are now obtained from all the chief makers, and are passed as suitable for boilers with a tenacity which must not fall below 26 tons, or rise beyond 33 tons; that is, they must fall between 58,000 and 74,000 pounds tenacity. Such plates would be required to show an elongation in a length of eight inches, on a test strip of 20 per cent. In calculating the

strength of such a steel boiler, the lower limit of 26 tons is used with a nominal factor of safety of 5, and our standard 7-foot boiler would only require to be .27" thick for 75 pounds pressure, or hardly more than ¼ the thickness of the iron boiler. Nothing excepting caution would appear to warrant the arbitrary fixing at 26 tons of the calculable tensile strength of steel plates, which possess the full ductility, with a tenacity of over thirty tons.

The persistent use of steel by one maker, and the gradual recognition of its advantages, coupled with the greater cheapness of its manufacture, have enabled us to obtain boilers sufficiently strong for the enhanced pressures of to-day, so that diameters of 7 feet 6 and 8 feet are now common in new work. Indeed, the old 7 foot standard may be said to have given place to the newer one of 7½ feet, if, indeed, 8 feet may not now be regarded as the typical boiler for factory purposes. So far, the compound engine has not been worked beyond the pressure of 100 or 105 pounds, and seven years ago pressures of 90 pounds were less common than the 100 pound examples of to-day.

The present 8-foot boiler, carrying 100 pounds, is made from half-inch steel plate, or $\frac{9}{16}$". With the double-riveted joint $\frac{9}{16}$ should be used, but with the butt joint and double cover strips, half an inch may be looked upon as safe. Considerable attention is now being directed to the enormous benefits which have arisen from the use of the triple compound engine at sea, and it will not be long before leading steam users will desire to secure further economy in fuel by their use. When this time comes, with its necessary demand of steam at 160 pounds and upwards, further modifications may be expected in the Lancashire boiler. Already the marine boiler has approached the land boiler very closely in general construction, and the two types will still further approximate. There is no reason, except that the makers of land boilers may be short of the proper machinery, why Lancashire boilers of 8 and 9 feet diameter should not be made from plates as thick as those of marine boilers, if necessary. For efficiency, it is not desirable that the diameter should be reduced. The furnace diameter of a 7-foot shell is 2 feet 9 inches. When diameters of shells grew to 7½ feet, the furnaces followed proportionately to 3 feet, and it was found that in a 3-foot furnace coal could be better and more efficiently consumed than in those of smaller size. Similarly, the 39-inch furnace of the 8-foot boiler is even more economical. For such diameters the Adamson flanged seam has always been found more than strong enough for existing pressures, and even for higher pressures there is no reason why it should not be equally suitable, excepting, perhaps, on the score of cost of construction; for, by shortening the sections of the tubes so as to bring the seams closer together, the Adamson flue may be indefinitely strengthened, and it is not the rule to place them nearer than perhaps two feet as a minimum. Beyond the strength thus secured, the corrugated furnace is therefore employed and has been the chief cause of the possibility, in a practical sense, of the employment of triple expansion engines, the pressures for which could not have been conveniently provided for except by its use. The corrugated flue, too, is much lighter than would be a closely flanged furnace of the older form.

Some few Lancashire boilers have been already fitted with corrugated furnaces, but it is not probable that very great use will be made of the principle until working pressures exceed 100 pounds, or the diameter of the furnaces is increased by an increase of shell diameter. In our next we shall deal more particularly with furnace tubes and their collapsing pressures.

A Wonderful Furnace.

A manufacturing friend sends us the following clipping, which he cut from the *Mechanical News*:

A surprising account is given of a furnace constructed by a Philadelphia inventor to secure the perfect combustion of coal, and thus avoid the great loss of heat and waste of fuel resulting from the imperfection of the best methods hitherto employed. "In a common cylinder stove, with a few kitchen shovels of coal"—so runs the statement of an eye witness of one of the exhibitions of this invention—"a fire was lighted, which, in a few minutes, without artificial draught, created a heat intense enough to melt cast-iron, spiegel, and manganese ore. These results are accomplished by so arranging the fire that two different currents of air of different temperature pass through separate parts of the grate. A partial vacuum is created in the center of the grate, and a cyclone in the drum of the stove, thus producing perfect combustion all over the surface of the coal. In fifteen seconds from the lighting of the fire the drum is red-hot. A few seconds more and a rapid vibration occurs in the drum, and is felt all over the room with startling effect. The cyclone in the stove is raging in full force, the drum loses its heat, and it is discovered that the air is being *drawn down the chimney*. Within *four minutes* from the time of lighting, the materials above mentioned *may be melted*, and yet the temperature of the room may be kept at a moderate heat. A 50-pound charge of coal will last 24 hours, so slow and so complete is the combustion."

Our friend inquires if this is not Keely. We don't know; it sounds something like him. but it is to be noted that there is a cyclone connected with this furnace. Real cyclones are not much understood; there is more or less mystery about them, and this leads those who are attempting or pretending to get more out of a thing than there is in it, to call in the aid of the cyclone, apparently believing or thinking that they can make others believe that a very small amount of potential energy will suffice for the development of tremendous dynamic energy if only it can be got into the form of a cyclone—which is a humbug, pure and simple. A cyclone—natural or artificial—creates no power.

The subject of the Conemaugh disaster coming directly within the field of the *Engineering and Building Record*, of this city, that journal has proven itself fully equal to the occasion, and has displayed commendable enterprise in sending a qualified engineer to the scene, and publishing telegraphic reports from him concerning such features of the case as only a competent engineer would be qualified to intelligently discuss. Commenting editorially upon the information contained in these reports, it says:

It seemed improbable that the engineers of the State of Pennsylvania should have been guilty of negligence in building so important a structure, and our dispatch shows that what is left of the dam is well built—their part of the work. For the height, however, at which the dam was left, or to which it had settled during nearly fifty years, the spill-way was inadequate. And though the dam failed from the erosion of its face and not from the pressure of the water, some one has an awful responsibility for not having made sure that the spill-way was of ample dimensions for any possible flood, and that the crest of an earthen dam holding such a large quantity of water, above a populous valley, was not entirely free from any danger of overflow.

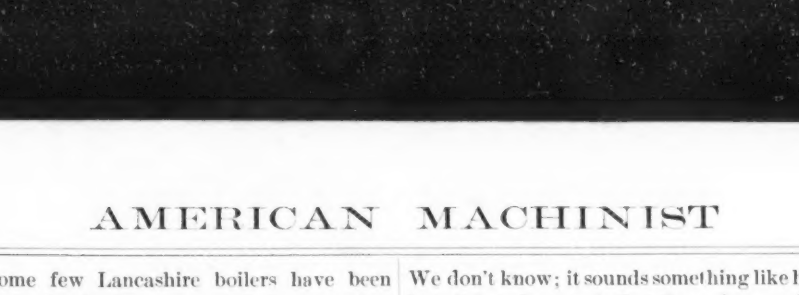


Fig. 15. Fig. 16.

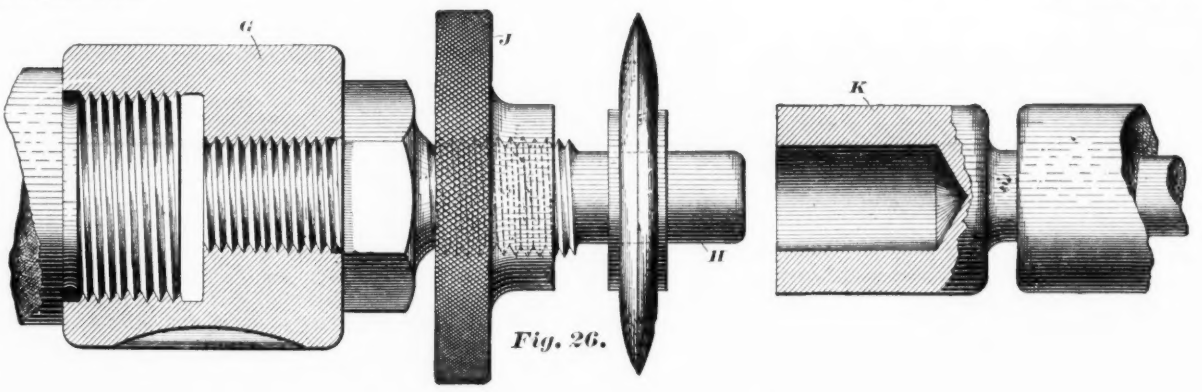


Fig. 26.

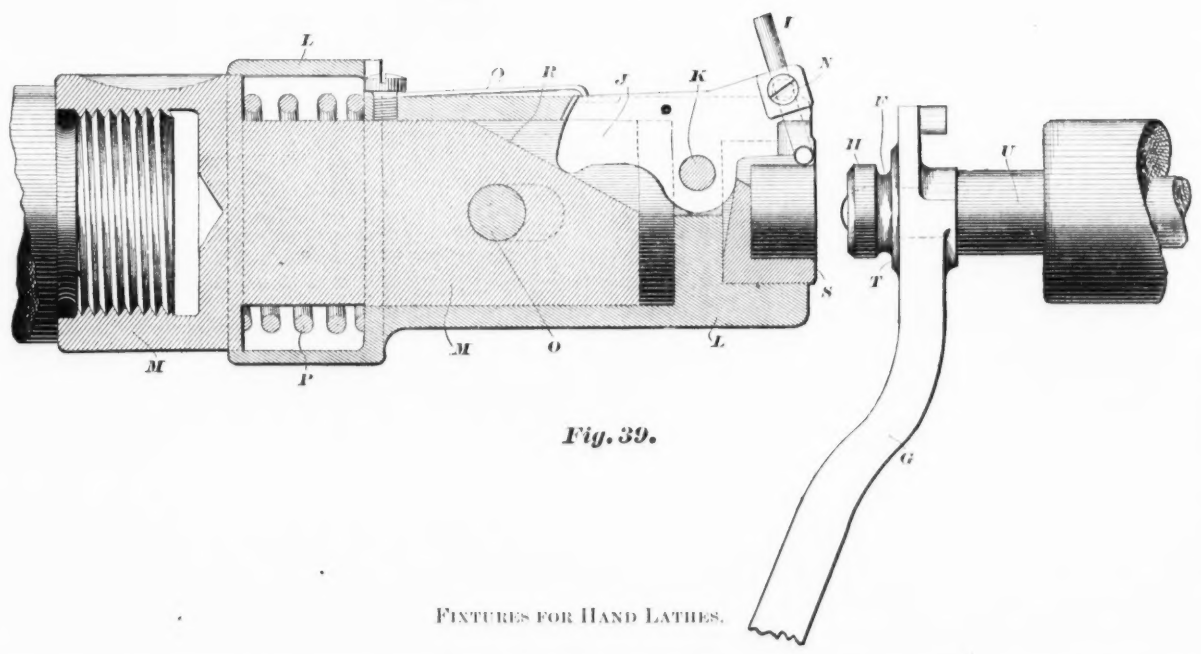


Fig. 39.

FIXTURES FOR HAND LATHES.

A Generous Offer.

Edw. F. Henry, engineer St. Louis Grain Elevator Co., sends the following communication, which explains itself:

At an entertainment given last evening (6th inst.), at Masonic Hall, by the Brotherhood of Stationary Engineers of St. Louis, they had for their guests: Hon. E. A. Hanan, mayor of the city, Prof. Woodward, of Washington University and Manual Training School, Messrs. D. E. Mier, Bryan, Angel, Hughes, Pond, Harker, Vail, Mueller, and numerous other representatives of the mechanical interests of the city.

Addresses were made by the several gentlemen present, on intelligent organization, the various types of steam engines, steam heating, etc. Prof. Woodward, in the course of his remarks, dwelt at length on the necessity of progressive mechanics constantly aiming for something better and more perfect than what we now have, and exhorted them not to sit down and pat themselves on the back and soothe themselves in the reflection that now we have attained the millennium. He predicted that the near future would witness more marvelous inventions than any we had as yet witnessed. He explained fully the mode of teaching practiced at the Manual Training School, and concluded by presenting the Brotherhood with a free scholarship to the Manual Training School for any youth they may select. The Brotherhood thankfully accepted the offer, and will lose no time in selecting some worthy and brainy youth, who will, it is to be hoped, prove a credit to the school and the organization.

Everything passed off without the slightest friction, and the members of the order were highly complimented by the guests and the local press for the masterly manner in which the affair was conducted.

Mineral Products of the United States.

The sixth report on "The Mineral Resources of the United States," by David T. Day, Chief of the Division of Mining Statistics and Technology, United States Geological Survey, is to be issued shortly. This report is for the calendar year 1888, and contains detailed statistics for this period, and also for preceding years, together with much descriptive and technical matter. From advanced sheets furnished us, we select the following statements:

Iron and Steel.—The principal statistics for 1888 were: Domestic iron ore consumed, about 12,060,000 long tons; value at mines, $28,944,000. This is an increase over 1887 in quantity of 760,000 tons, but a decrease in value of $4,956,000. Imported iron ore consumed, 587,470 long tons; total iron ore consumed in 1888, about 12,650,000 long tons, or 150,000 tons more than in 1887. Pig-iron made in 1888, 6,489,738 long tons; value at furnace $107,000,000. This is an increase over 1887 of 72,590 tons in quantity, but a decrease of $14,925,800 in value. Steel of all kinds produced in 1888, 2,899,440 long tons; value at works, $89,000,000. This is a decrease from 1887 of 439,631 tons in quantity and of $14,811,000 in value. Total spot value of all iron and steel made in 1888, in the first stage of manufacture, excluding all duplications, $145,000,000, a decrease of $26,103,000 as compared with 1887. Limestone used as a flux in the manufacture of pig-iron in 1888, about 5,438,000 long tons; value at quarry, about $2,719,000.

Coal.—The total production of all kinds of commercial coal in 1888 was 142,037,735 short tons (increase over 1887, 18,022,480 tons), valued at the mines at $204,221,990 (increase, $30,625,994). This may be divided into Pennsylvania anthracite 43,922,897 short tons (increase, 4,416,642 short tons), or 39,-

216,872 long tons, including 38,145,718 long tons shipped by the railroads and canals and reported by their statistician, Mr. John H. Jones, and 1,071,154 long tons sold to the local trade at the mines (increase 3,943,430 long tons), valued at $85,649,649 (increase, $6,284,405); all other coals, including bituminous, brown coal, lignite, small lots of anthracite produced in Colorado and Arkansas, and 4,000 tons of graphitic coal mined in Rhode Island, amounting in the aggregate to 98,114,838 short tons (increase, 13,605,838 tons), valued at $118,572,341 (increase, $24,341,589).

The colliery consumption at the individual mines varies from nothing to 8 per cent. of the total output of the mines, being greatest at special Pennsylvania anthracite mines and lowest at those bituminous mines where the coal bed lies nearly horizontal, and where no steam power or ventilating furnaces are used. The averages for the different States vary from 2 to 6.4 per cent., the minimum average being in the Pennsylvania bituminous and the maximum average being in the Pennsylvania anthracite region.

The total output of the mines, including colliery consumption, was: Pennsylvania anthracite 41,624,610 long tons (increase over 1887, 4,045,863 long tons), or 46,619,564 short tons (increase 4,531,367 short tons); all other coals, 102,039,838 short tons (increase, 14,152,478 tons), making the total output of all coals from mines in the United States, exclusive of slack coal thrown on the dumps, 148,659,402 short tons (increase, 18,683,845 tons), valued as follows: Anthracite $89,020,483 (increase, $4,468,302); bituminous, $122,497,341 (increase, $24,492,685); total value $211,517,824 (increase, $28,960,987). The above figures show a notable increase in 1888 over 1887 in the aggregate output and value of both anthracite and bituminous coal, although not as great an increase as occurred in 1887 over 1886 in the value of the anthracite, or in the total tonnage of the bituminous coal.

Natural Gas.—The amount of natural gas consumed is given in coal displacement; that is, the amount of coal displaced by the use of natural gas. It is estimated that the amount of coal displaced by natural gas in the United States in 1888 was 14,163,830 tons, valued at $22,662,128. Of this amount 12,543,830 tons were displaced in Pennsylvania; 750,000 tons in Ohio; and 660,000 tons in Indiana.

An English Engineering Establishment.

With this we present engravings showing the plan and some of the details of construction of an engineering establishment recently erected by Geo. Richards & Co., at Broadheath, near Manchester, England. The principal points kept in view in the construction of the works were *first*, the matter of supervision; *second*, the convenience of handling the material. For this purpose the work is all done on one floor, and every part of the floor is covered by overhead traveling cranes, except the space under the gallery, which is only used for small tools and lathes. In order to carry out this system of construction, it was necessary to place the shafting for driving under the floor. To do this, a number of medium size main shafts were required, one for each bay being necessary to drive the machines at all points on the floor above. The planing machines, boring machines, drilling machines and slotting machines were all easily driven from below, but in the case of lathes the countershaft required fixing overhead, which was readily done to the wooden beams of the roof. The various line shafts under the floor are connected together by a system of rope driving. In practice this arrangement is found to answer in every way, and to be convenient for changing pulleys or adding new lengths of shafting, examination of bearings; in fact, all the work done in connection with the main shafting is readily done by having it under the floor. At first glance it might be assumed that this system of construction of the buildings was more expensive; but the actual estimates for building showed that the placing of the floor six feet above the ground added very little expense, and the perfect ventilation under the floor, to protect the timbers, was thought to more than compensate for the slight difference. All the timbers under the floor are periodically whitewashed. No preparation was required for the ground, except to put in small concrete piers. The method followed in the construction was somewhat curious. The works were built entirely by the proprietors, and, being engineers rather than builders, they were untrammeled in the method of procedure, and therefore the following plan was adopted. The columns were jointed at the floor line, as shown in the detailed drawings, Fig. 5 (page 7). The short columns under the floor were first erected, and the timbers and floor secured to them, when a level floor was thus obtained, on which a traveling derrick was used to lift up the columns, beam and roof. This method of construction was exceedingly rapid. On one special day, one complete bay was added to the works, measuring 150 feet long by 18 feet wide, thus demonstrating the advantages of the system. The roof used is of the form generally employed in England for weaving-sheds, the glass being placed to the north to get a good light, and to avoid the heat of the sun. The roofs are covered with slates laid on planed and matched boards, the under sides of which are painted, this giving a very finished appearance to the interior of the works. It will be noticed that the foundry as well as all the buildings have this form of roof, experience having shown it to be far the cheapest and the readiest to erect. The principal machine shop is divided into two parts, the machinery being placed on one side, and the fitters' benches on the other, the total length of the benches being 400 feet.

The water is taken from the roof, down alternate columns, and is carried away by water pipes under the floor. The space under the stores department. The works are lit up entirely by electricity, 7 dynamos, 40 arc lights of 2,000 candle power, and about 100 incandescent lights being employed.

The foundry is arranged in two parts, one for heavy work up to 10 tons, the other for light work. The same idea is carried out here, of having all the operations inside the walls, so that it is all under the supervision of one foreman. The cranes run on trucks supported by arched walls. The same roof is used, with the addition of ample Louvre for the smoke. The roof timbers are all planed and whitened.

The pattern shop is placed in a gallery, and is convenient to the drawing office. The ceiling underneath the gallery comes at a suitable height for countershafts for small lathes.

The building set apart for the manufacture of line shaft fittings, pulleys and general millwright work has the same system of roofing, and has the same general construction as the main fitting shop, except that the floor is not raised above the ground. In this building is concentrated a foundry, used specially to make the castings for this department. This is owing to the great variety of patterns required, and the convenience of having the foundry and finishing under one management.

The building which is occupied by this portion of the work is 200 feet by 125 feet.

The works have a side track from the London & Northwestern Railway. The tracks run into the foundry, also into the main fitting shop, for the heavy work that is handled. The same track is made use of for moving the heavy castings out of the foundry to the machine shop.

A system of small narrow gauge railways is being laid down in the works as shown in the plans.

The storage sheds for scrap-iron, coke, sand, clay, and other material used in the foundry are placed next to it, also a storage shed for the storing small castings.

The caretaker's cottage is erected on the premises, in which the watchman lives, for safety in case of fire.

The upper part of the clock tower is fitted with a large water tank, and a 2" pipe leads all over the premises. At every 25 yards is placed a tap and hose pipe permanently attached.

The entire plant is not shown by the engravings, there being several buildings of minor importance, which for lack of space we do not show.

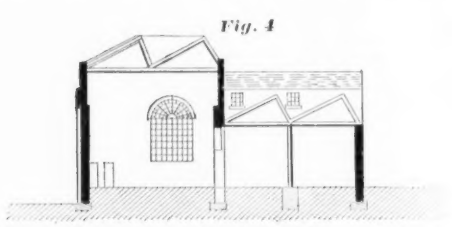


Fig. 4

Fig. 3

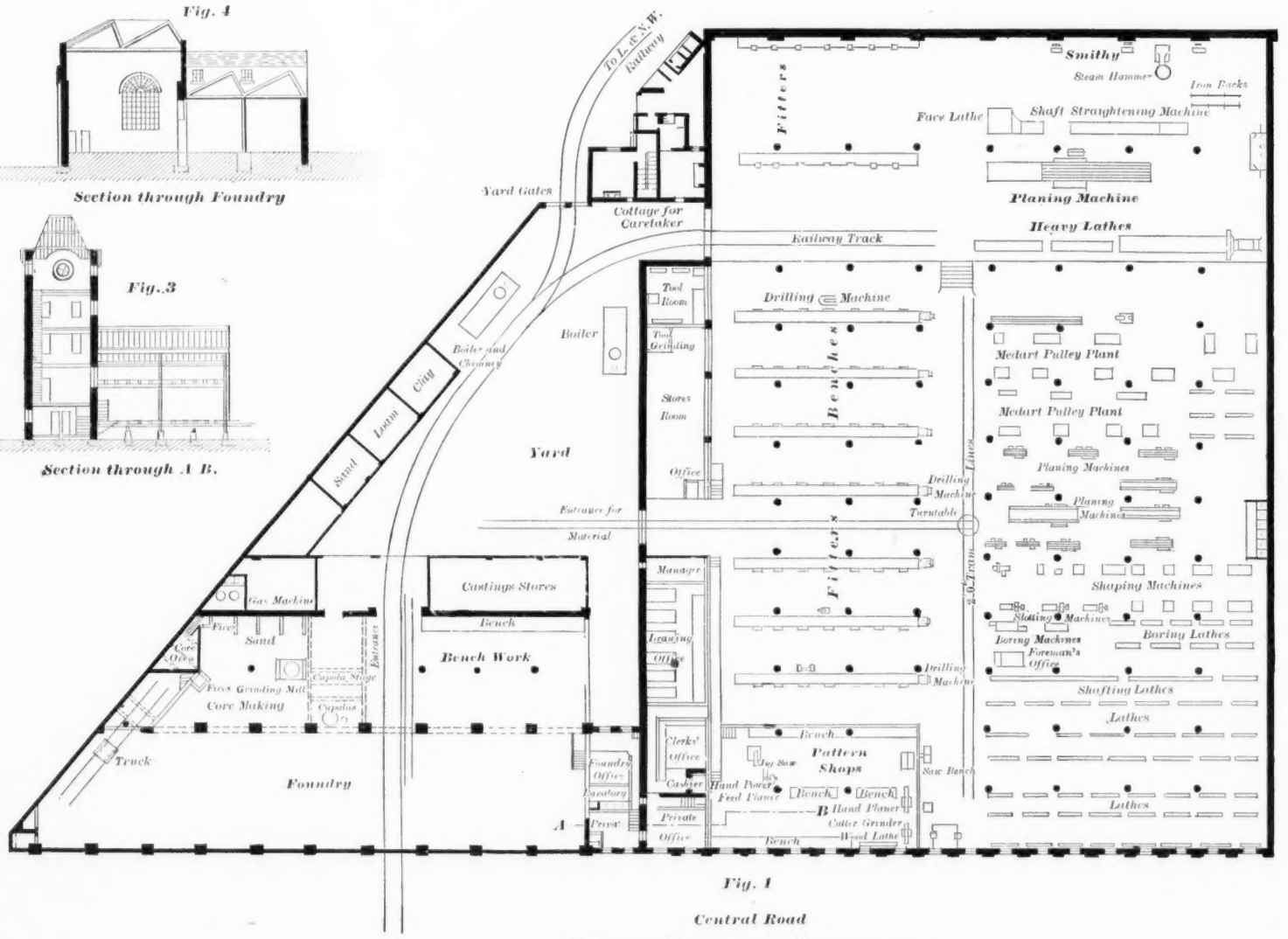


Fig. 1

Central Road

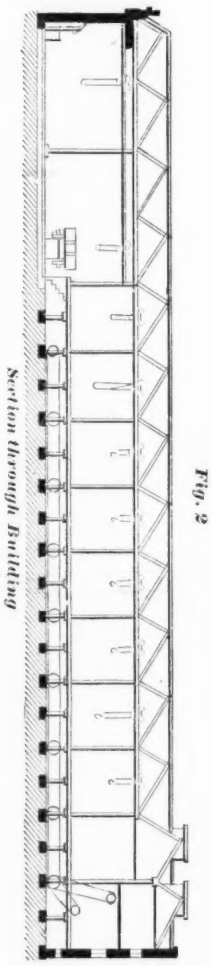


Fig. 2

AN ENGLISH ENGINEERING ESTABLISHMENT.

LETTERS FROM PRACTICAL MEN.

Drawings for Pattern Makers.

Editor American Machinist:

I have read with considerable interest the various articles by different writers on the subject of drawings for pattern makers and other departments of the machine shop.

I thought that I would endeavor to give my ideas on the subject, as exemplified by my own practice. I have worked a good deal at the bench as pattern maker, and prefer at all times, when the work will admit of it, to have a full-size shrink-rule drawing, even if I have to make it myself. But I have found, as might be expected, that I cannot make such a drawing in the pattern shop, with pattern shop appliances, as quickly or as well as I can when in the drawing office with my drawing office outfit.

I also find that, from the practice of working in the shop, or some other cause, I can judge of the proportions of a piece of work much better from a full-size drawing than from one on a smaller scale.

Several years ago, after trying to get drawing scales with shrink-rule divisions without success, I made from my Brown & Sharpe steel shrink-rule a set of scales 6 inches, 12 inches and 24 inches long, and have used them with much satisfaction ever since.

I now make full-size drawings of all patterns with my shrink-scales, giving figures only where fitting or machine work is required to be done, showing holes only when they are to be cored, and always, when anything different from the usual run comes along, consulting both the moulder and pattern maker as to the best way to design the article for both moulding and pattern making, to insure the best result.

I make my machine shop drawings on sheets 12″x18″, as far as I can use them, and 18″x24″ next, and so on, doubling the sizes, using blue prints with only those dimensions given that are necessary in the shop; for of two evils I am in doubt which is the worse—leaving out dimensions which are necessary, or putting in dimensions which are unnecessary; the understanding being that, wherever a drawing is figured, it means that there is work to be done on that piece to bring it to that size, and not otherwise.

I much admire Chordal's system of card drawings, but consider it too expensive for anything but staple articles, which are to be made in quantities, when, I know, from having used it, that it is the best system that I have so far heard of.

I make my pattern drawings on cheap manila paper, and expect the pattern maker to make any marks he pleases on them, such as laying out courses of segments and thickness of pieces in building up, etc.

I also find that being able to lay the pattern direct on the drawing is a very convenient check against mistakes which are likely to creep in even with the most careful men.

I have tried to get scales with shrink-rule divisions from Brown & Sharpe, Keuffel & Esser and others, but so far without success.

I have come across a few pattern makers whose prodigious dignity was infringed upon by having shrink-rule drawings provided, as they looked upon them as an insinuation that they were not supposed to be capable of making proper allowances, but at the same time I did not find the work of those high-toned individuals as free from mistakes as for my own satisfaction I would have wished it to have been. WM. J. SILVER.

Salt Lake City, Utah.

Prof. Sweet's Lathe.

Editor American Machinist:

I see a great deal to admire and but two things to condemn in the new engine lathe illustrated in the issue of May 30th of the AMERICAN MACHINIST.

The legs under the tail-stock appear to me to be inadequate to bear the weight and stand the strain when turning heavy stock, and the rings used in the center rest will be found to be a nuisance when turning long and heavy pieces; because the rings must be put off and on the end of the piece, and, on account of the screws being on the inside of the rings, they are not as handy to work as the regular style.

I have seen a center rest made something after the form of this one, but it was merely a ring with three $\frac{5}{16}$″ set screws having a loose fit, and sometimes when turning a taper piece it would turn the screws around, making it useless, so it was discarded and the regular style used. JOSEPH J. HARROP.

Steamboat "Puritan."

The steamboat "Puritan, the recent addition to the fleet of the Fall River Line of steamers, recently made an excursion trip through the Narrows, around the lightship, and in returning, ran for some distance up the North River. It was not the intention to test her capabilities on this trip, and consequently no effort was made to rush her and obtain a high speed; in fact, all her boilers were not in use; she simply sailed along very leisurely, giving the large number of invited guests, as well as the officers, an opportunity to enjoy themselves as much as possible.

The report printed in a number of our daily papers—that she made twenty-two miles in an hour and five minutes—is not correct; but what she really did do was to point to the fact that the promise of her construction has been fulfilled, and that her future record will probably exceed the expectations of her designers.

The "Puritan" is probably the largest boat of her class which has been built; her dimensions of hull, engines, illustrations of her outside appearance and deck plans have been given in our issue of March 21, 1889. The design, proportions and workmanship of her compound engines reflect great credit upon the W. & A. Fletcher Company, of New York, who were the sole contractors of her construction from beginning to the end.

The model and general plans were designed by Mr. George Pierce, Supervisor of Steamers of the Old Colony Steamboat Co. In designing this steamer, every advantage has been taken of former constructions, and every device and improvement suggested by past experience and progressive invention has been utilized, so that to-day she represents the finest exponent of marine vessel construction.

On the evening of June 13th—the day during which the excursion trip was made—a large number of persons who gathered on board of the steamer in response to invitations had an opportunity to inspect the steamer, and the beauty of the general style of the ornamental and decorative finish was fully realized, and shown to great advantage under the rays of the electric light; some idea of the amount of finish in the different departments may be obtained, when it is understood that in the gilding alone 185,000 gold leaves, each 3⅜ inch square, were used; and in painting the ship, nearly 100,000 pounds of lead were used. Yet it cannot be said that the finish is gorgeous, but it is artistic in style and design, exquisitely tasteful in coloring, and blending the finest ornamental effects in rich succession. In the main saloon, the beauty and finish of the festoons of vine and leaf work which ornament the masts and columns standing in this portion of the ship was greatly admired. Every leaf and projecting twig presents an individual or clustering electric light, and the artistic effects produced by their design and combinations are excellent.

The efforts of the designers and builders, directed towards the promotion of the safety, comfort, convenience and accommodation of passengers, will undoubtedly be appreciated by those who patronize this line of steamers.

The "Puritan" will go in active service on the 17th inst.; her first regular trip will be from Fall River to New York.

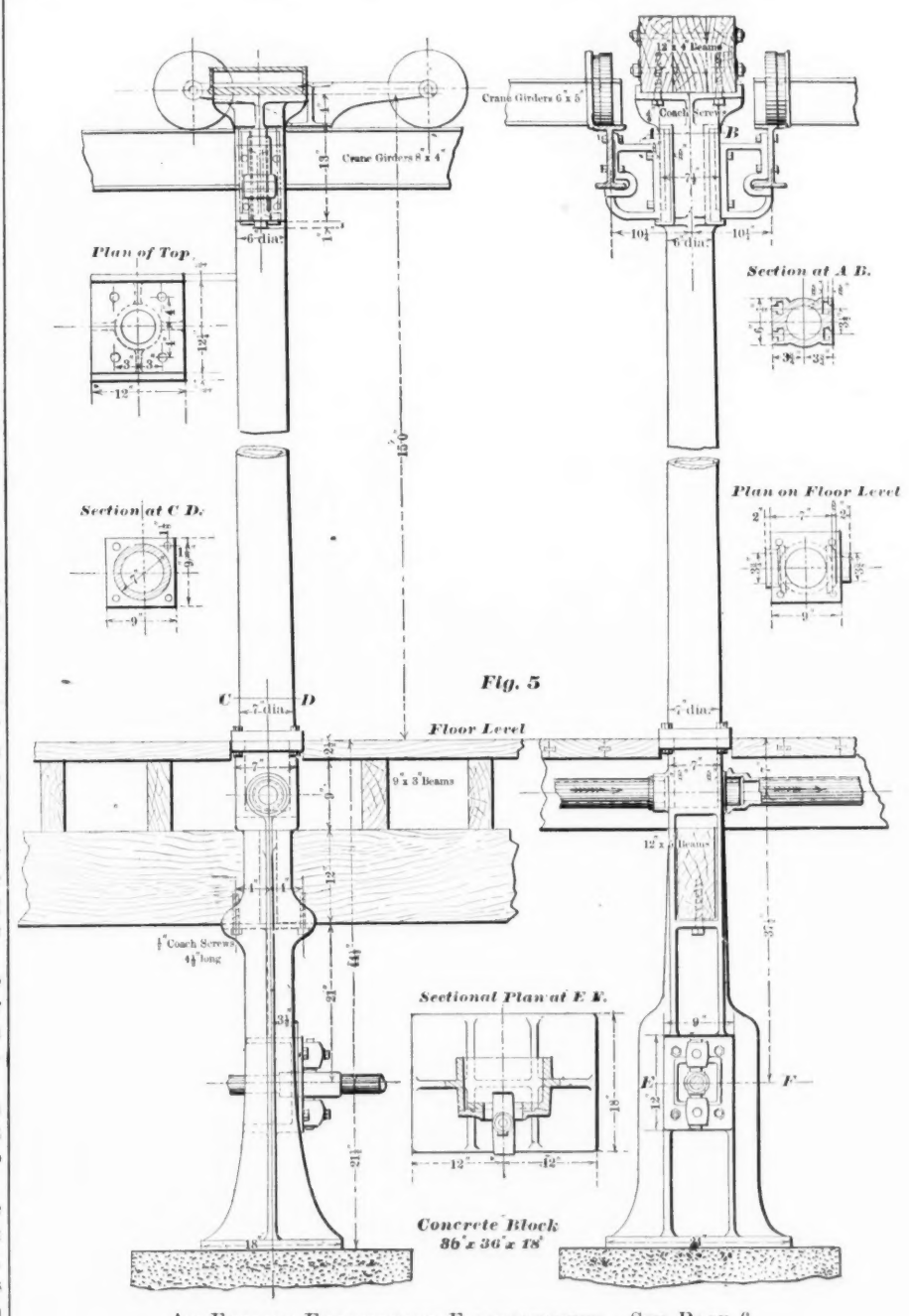


Fig. 5

AN ENGLISH ENGINEERING ESTABLISHMENT.—SEE PAGE 6.

An Avoidable Railroad Horror.

Mingled with the feelings of horror and sympathy which all must experience on reading the accounts of the recent terrible railroad accident in Ireland, by which over seventy lives were lost, will be a feeling of self-congratulation on the part of Americans at the thought that it is now practically impossible for that particular kind of an accident to occur to a passenger train on any road of consequence in this country. Passenger coaches detached from the engine, either purposely by the trainmen, or by accident on an ascending grade, would be securely held by the automatic brakes. If these brakes had been in use on the Irish road, it is safe to say that they would have saved the lives of these unhappy excursionists, to the destruction of which another variation from American railroad practice seems to have contributed, *i. e.*, the compartment coaches with doors on the sides securely locked, so that there was small chance for the imprisoned people to escape.

The spirit of conservatism has cost dearly in this instance, and there is no escape from the conclusion that, for the killing of these people, there is not the least shadow of an excuse.

We are glad to note that it seems likely that the Cambria Iron and Steel Works at Johnstown will not be long in resuming operations, considering the tremendous difficulties which they have to encounter. As the existence of the town itself depended to a very great extent upon this establishment, it is of course a matter of importance to the surviving citizens, as well as to the members of the company, that operations should be resumed as soon as possible. The price of the stock of the company upon the market indicates that there is entire confidence among those having an opportunity to judge, that, notwithstanding the very heavy loss of the company, it will soon be in as good shape as before.

A cable dispatch to the *New York Herald*, dated London, June 13th, says that the American Engineers had had a very busy day listening and responding to addresses of welcome, banqueting, etc. Mr. Robert T. Lincoln, United States Minister, said that the present occasion was one of many which had come under his notice, as showing the perfect good feeling that bound America and England together, that much of this international amity was due to the work of engineers, who were rapidly destroying time and space, and that he hoped this good feeling would continue forever.

The Locomotive, referring to the recently formed organization of boiler manufacturers, says:

"This organization of boiler manufacturers cannot fail to interest every man who has anything to do with boilers; and we sincerely trust that the practical workings of the association may prove as beneficial to the public as the gentlemen interested in the movement hope to make it. Any step that leads to improvement in either workmanship or material ought to be hailed with joy."

Correspondents, who send us communications or questions signed "Constant Reader," "A Subscriber," etc., and without any other name or means of identification, are doubtless at a loss sometimes to account for the fact that no attention is paid to them. But it is our invariable rule to put communications which do not bear the real names of the writers into the waste basket.

The President of the Institution of Mechanical Engineers (of Great Britain) in a recent address to the members, compared the American and English systems of granting patents upon inventions, saying that the former seemed to possess decided advantages over the latter.

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J. G. A. MEYER, } Associates.
FRED J. MILLER, }

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☞ *We are not engaged in procuring patent rights, or in selling machinery, nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draftsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, JUNE 20, 1889.

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Some Lessons of the Great Disaster.

There is no need at this time to recount the terrible story of the flood which has laid waste most of the prosperous manufacturing city of Johnstown and neighboring villages, and destroyed the lives of thousands of men, women and children; our readers are familiar with every horible detail.

About all that can be done now, besides rendering the much needed assistance to the afflicted survivors of the terrible disaster, is to call attention to the preventable causes which led to it, and to the lessons which may be learned from it.

It is difficult to imagine a combination of circumstances which would be any better calculated to produce just such a disaster than those presented by the situation of Johnstown. Above the city, on the one hand, a weak and improperly constructed dam, holding above the heads of fifty thousand people a vast volume of water, containing the potentiality of utter destruction to all in the valley below it, while, upon the other hand, below the town, was a firm and substantial stone bridge capable of withstanding almost any shock which might be brought against it, and well calculated to hold the debris brought down by the flood, and thus to form a second dam to back up the waters far above the height to which they would otherwise have risen, and complete the work of destruction.

The first thought suggested by the calamity is that no dam maintained for the purpose of merely affording pleasure to a select few should be allowed to exist under such conditions that, by its failure, the water held back by it could be precipitated upon communities of people below. While it is true that a dam could be constructed which would in all human probability hold securely such a volume of water as destroyed the miserable embankment of earth, stone and clay, by courtesy called the Conemaugh dam, yet it is not likely that such a dam as would be needed to do this would ever be built by a club whose only object was to secure a fishing and boating summer pleasure resort. We do not believe that even the best of dams should be maintained in such situations for such a purpose. But there seems to be ample evidence that this, instead of being one of the best of dams, was one of the worst, and that there were plenty of persons competent to form an intelligent opinion regarding it, who for a long time had considered it a menace to the lives and property of the people of the valley, and had repeatedly declared it to be such.

The failure of this dam does not, as many seem to think, furnish a valid reason for prohibiting the erection of *real* dams, built under the supervision of disinterested and competent engineers, especially when built for some useful public purpose. We suppose it can hardly be said to be possible to construct a dam which no combination of circumstances or upheaval of nature could possibly destroy, but it is indisputably true that dams have been built, from the existence of which the people living below them run far less risk of injury than by the ordinary contingencies of life. Such dams can yet be built and will be, but will differ in every important particular from the Conemaugh dam; they will be of different material, will be highest where it was lowest, strongest where it was weakest, and instead of utterly inadequate spill-ways, obstructed by gratings put in to confine game fish, will have ample means for allowing unusual quantities of water to escape without doing harm.

As to the floods which are to be provided against in the construction of a dam, it is important to consider that the character of these floods is in many cases being continually changed by the cutting away of forests and by the artificial draining of land, both of which causes have the direct effect of increasing the suddenness and violence as well as the total volume of water passing down a natural water-way, in times of unusual rainfall. The first of these causes at least seems to have very materially contributed to the bringing of the fatal strain upon the Conemaugh dam; a fact which would indicate either that an allowance should be made in the construction of a dam for the cutting away of the forests above it or the cutting of the timber in some manner restricted, with the preference for the latter.

The clamor which has arisen against the erection of dams of any kind for any purpose is as senseless as would be an opposition to the erection of houses, because some of them are improperly constructed and fall or are burned. Dams can be constructed which will be as safe as anything else on earth can be; there are engineers that know how to build such dams, and all that is required to build them is the will to do so, and sufficient money.

If it be true, as the reports say, that the man in charge of this dam had repeatedly warned the members of the club which maintained it, that it was in a dangerous condition; and that he was finally given to understand that he would lose his place unless he stopped annoying them about it, then their responsibility becomes about as heavy as men can well be called upon to bear, and we hope they will be made to feel its full weight. They can never repair the damage their ignorance or negligence has caused; but owners of other dams so situated that their failure would result in loss of life or of property should be made to feel the absolute necessity for procuring competent engineering advice and supervision, and for reducing the risk of disaster to the lowest possible limit.

The destruction of Johnstown, like all great calamities, has afforded an opportunity for the exhibition of the noblest traits of humanity on the one hand and of the most ignoble upon the other. The hearty and generous response of the people all over our own and in many foreign countries to the calls for assistance coming from the devastated valley, have been extremely gratifying, and will do as much as human efforts can do to mitigate the horrors of the situation.

Contrasted with this noble forgetfulness of everything else except that human beings were sorely in need of help, which could and should be rendered, is the action of a few, reported to be Hungarians, who, in the midst of the wreckage of houses filled with dead and mangled humanity, went about mutilating the bodies of women to secure their jewelry. By this they showed, as the papers have said, that they were brutes; devoid of the first instincts of human beings. Such a thing is horrible and revolting enough, but why should any one be surprised at this exhibition of brutality by such men, under such circumstances? Are not these men here because they are little better than brutes and can work and live as brutes? They and their ancestors before them have lived for generations under the most brutalizing conditions, well calculated to deprive men of the last instinct of humanity; and it is because they have been reduced to such a condition that they no longer consider necessary the conditions of living which other human beings deem it necessary to secure, that they are brought to this country, to work in the coal mines at wages which Americans are not yet reduced low enough to enable them to live upon. There are many thousands of such men in the mining regions of Pennsylvania, and every one knows that they are regarded as mere brutes. In times of disaster and of temporary social disorganization and consequent removal of restraint, can they be expected to do otherwise than show their brutality?

These men work and exist under such conditions as could not be borne except by those who have few ideas or ambition above mere brutes; and though we may be shocked at such an exhibition of their brutality, we should not be greatly surprised. And when we stop to think what sort of an effect would probably be produced upon us if we were compelled to live as they live, we shall probably not be inclined to greatly blame them. At any rate, we submit that the unlawful killing of some of them is a very poor remedy. Rather let the conditions which produce such men, and bring them to this country, be examined, and the remedy applied to them.

A mechanical contemporary—one of whose weaknesses takes the form of publishing in its columns the flattering letters received from its readers—has recently published such an one, in which allusion is made to the AMERICAN MACHINIST. The letter is from a woman, and is referred to by the editor as an "affectionate" letter, and as "A PATHETIC LETTER FROM A BRAVE WOMAN." The most pathetic feature of the case is the lack of taste displayed in the publication of such a letter, in what purports to be a mechanical journal. It might do well enough in the *Slumptown Bazoo*, or the *Arizona Kicker*.

QUESTIONS AND ANSWERS

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(247) J. M. M. Philadelphia, Pa., asks: If an air chamber is filled with proper proportions of gas and air, can the gas and air be exploded by an electric spark? *A.*—Yes. Your other question we cannot answer, as you have not given us sufficient data. We believe the work on "The Gas Engine," by Dugald Clerk, will help you, and enable you to obtain the information which you seek.

(248) E. B., Columbus, Ohio, writes: I am building a small engine, having two cylinders set at right angles to each other; diameter of cylinder, 2 inches; stroke, 4 inches; number of revolutions to be 400 per minute; steam pressure, 60 pounds per square inch. What is the horse-power of each cylinder, and what is the horse-power of both cylinders. *A.*—Each cylinder will develop about $\frac{12}{33}$ dicated horse-power; the two together will develop about $\frac{12}{33} \times 2 = \frac{24}{33}$ indicated horse-power.

(249) J. L. R., Philadelphia, writes: In your issue of August 13, 1887, is a table of the angles for grinding tools for the lathe and planer. How can I find the angle for curved faced tools by that table without the machine? *A.*—We do not think you make much use of that table without the machine. 2. Will you please give a rule to find the force of a blow of a steam hammer in pounds? *A.*—See answer to Question No. 240, June 6 issue. 3. Can a person ask questions too often? *A.*—It might be possible to do so, but we have never had occasion to complain of the number of questions asked by any one.

(250) F. S., Columbus, Ind., writes: Where a pulley or a cylinder is required to be balanced by the use of a weight, and it is balanced perfectly on straight-edges while standing, will it be in balance when running at high speed? and if not, please state why. *A.*—It may or may not be in balance at high speed, depending upon circumstances; but in the case of a cylinder, it will usually not be, unless pains are taken to secure running balance. You will find the matter explained in the answer to Question 222, issue of May 16, and more fully in an article on the subject in issue of Sept. 16, 1882.

(251) F. B. S., ———, asks: Which is right for an involute rack—that the sides of the teeth shall be curved like the gear, or be straight and inclined to the pitch line 75½°? I have Brown & Sharpe's "Practical Treatise on Gearing," and it says that the sides of the teeth in an involute rack should be straight on an incline of 75½° with the pitch line of the rack; and yet we have rack-pitch gauges in the shop, bought from Brown & Sharpe within two weeks, on which the sides are curved. I am learning, and wish to know which is correct. *A.*—The teeth of racks, to mesh with *single curve* involute tooth gears should be straight and inclined 75½°; all others are curved. You will find the matter explained in the book of which you speak, on pages 12 and 27.

(252) W. M., Argentia, Ill., asks: 1. If a scale is forming in the boiler, what course would you pursue? *A.*—We would have the water analyzed, and thus find out what compound, if any, for the prevention of scale should be used. 2. How would you test a crank-pin in order to determine whether it is square to the crank? *A.*—Disconnect the crosshead and the main rod, take up the play between the crank-pin and brasses, and key the rod to the crank-pin. Place the crank successively on its dead centers, and also on its high and low center. If in these positions of the crank the main rod is exactly in line with the crosshead pin, it will be true enough for all practical purposes. 3. How can I obtain your paper? *A.*—You should be able to obtain it from any newsdealer, or you may send your order to our office, and it will be promptly attended to.

(253) W. H., ———, writes: The last issue of the AMERICAN MACHINIST contained the answer to my questions regarding spiral gearing. The questions were, how many teeth should there be in a gear 2½" pitch diameter cut at an angle of 45°,

12 pitch. Also, if there was a rule for calculating the teeth of spiral gearing for all angles and pitches. The answer to the first was 24, and to the second that the rule was the same as for ordinary spur gearing. It is not quite clear to me how you got the number 24 by that rule. We cut the gears by the cut and try rule, as we knew of no other, and could get in only 22 teeth. There seems to be quite a discrepancy between the rule, the number of teeth given by you, and the number actually cut. Will you please explain? *A.*—It is not quite clear to us either how we got the number 24. But at any rate, it is a palpable mistake; the gears, by the rule we gave, should have 30 teeth. By using the regular 12 pitch cutter you have gears the *normal* pitch, which is about 12, and figured in this way, they would have 21 teeth and a fraction over.

(254) C. G., Detroit, Mich., asks: What advantage is there in a tandem compound engine over a simple expansion engine? *A.*—The reason generally given why so great an economy cannot be effected in one cylinder as in two cylinder compound engine is that at every stroke the inside of the cylinder of the simple expansion engine would be put into direct communication with the condenser, and its temperature thereby lowered to nearly the same temperature of the condenser; consequently, if fresh steam of a high temperature were introduced into a cylinder which has been allowed to become comparatively cold, a very large quantity of the steam would be immediately condensed. If, however, the temperature of the steam is split up into two stages, by causing it to do work in two successive cylinders, then it is only the last cylinder which comes into direct communication with the condenser. Therefore the range of the temperature in the first cylinder is comparatively so small that the amount of initial condensation will be considerably reduced, and thereby economy in fuel promoted.

(255) E. V. V., Hoboken, N. J., writes: 1. Please give me a rule for finding the horse-power of a marine boiler according to the laws of local inspectors. *A.*—We are not aware that the Board of Supervising Inspectors have established any rules for finding the horse-power of marine boilers. 2. If a slide valve is cutting off at a certain point of the stroke, and if it is desirable to change the point of cut-off, what is to be done? *A.*—Change the lap; this will also necessitate a change in the position of the eccentric. 3. When the cut-off is regulated by independent cut-off valves on the back of the main valve, the cut-off valves being connected by a right and left-hand screw, then, in order to change the point of cut-off, I say the distance between them should be increased or decreased as the case may require; am I right? *A.*—Yes. But it should be remembered that some of these cut-off valves cut off with their outer edges; others cut off with the inner edges. In the former case, the cut-off valves are moved closer together to obtain a later cut-off; in the latter case they are moved further apart for the same purpose.

(256) A. F. M., Humbolt, Kansas, writes: Enclosed you will find a photograph of boiler with blister, which occurred at the Humbolt Water Mills of this place on the afternoon of May 1st. The picture shows the boiler as it appeared after the front was removed for repairs. The boiler is 60 inches diameter and 16 feet long, forty-five 3¾ inch tubes, and has to furnish steam for a 16x48 inch Corliss engine, and is fired with natural gas and coal together. At the time the burning occurred, it had only run 50 hours since being washed out. The boiler is forced to more than double its actual capacity, and it is utterly impossible to run with less than 100 pounds boiler pressure. The sheet next back of this was blistered and taken out about five months ago, and now this has occurred. What is your opinion of the pressure this boiler ought to carry with the last patch put on? Also, what do you think would have happened if the bottom of this blister had given away—would there have been an explosion, or would it simply have blown out? *A.*—By the appearance of the photograph, we should judge that the blister is about 18 inches diameter, and about 5 to 6 inches deep; its form resembles a portion of a sphere; the blister is at the bottom of the boiler, and in a place where the boiler is probably subjected to the greatest heat. The thickness of the shell is not given; neither is it stated whether the boiler is made of iron or steel; we presume that it is made of iron. In our opinion the blister is caused by overheating the iron, and perhaps it is also partly due to a poor quality of iron. Under these conditions, and because the boiler has been patched, we believe that a steam pressure of 100 pounds is more than the boiler should carry. If, on the other hand, the boiler is not worked beyond its capacity, and the iron is of a good quality, ⅜ of an inch thick, having a tensile strength of 55,000 pounds per square inch, seams double-riveted where necessary, then a pressure of 100 pounds will not be too great for the boiler to carry. Our advice is to have the iron tested, and thus determine the pressure which the boiler can carry with safety. As to the consequences to which the blister may lead, it may be said that, when iron is overheated, it changes its structure from fibrous to a coarse granular, losing in strength and ductility, and becomes more brittle. The loss in tensile strength in overheated iron plates has doubtless been a cause of many boiler explosions, and can only be explained by the possibility that the continued variation and differences of temperature of the outer and inner surface of the plate have diminished the cohesion of the fibers composing it. We believe we are correct in saying that you have been fortunate in escaping an explosion.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Thursday for the ensuing week's issue

Gear wheels and g-cutting. Grant, see adv., p. 16.

Link-Belting and Sprocket Wheels.

Send for Catalogue of Link-Belting.

Over 50,000,000 feet of Link-Belt in use.

Link-Belt Engineering Co., Philadelphia and N. Y.

$100 Reward, page 14.

$100 Reward, page 14.

$100 Reward, page 14.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

20″ Upright Drills. J. E. Snyder, Worcester, Mass.

23″ Upright Drills. J. E. Snyder, Worcester, Mass.

25″ Upright Drills. J. E. Snyder, Worcester, Mass.

28″ Upright Drills. J. E. Snyder, Worcester, Mass.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

The best Upright Hammers run by belt are made by Jenkins & Lingle, Bellefonte, Pa.

R. Dudgeon, 24 Columbia st., New York. Improved Hydraulic Jacks and Roller Tube Expanders.

Drop Presses, Punches and Shears. Williams, White & Co., Moline, Ill., manufacturers.

Hand, Nut, Taper and Pulley Taps. S. W. Card & Co., Mansfield, Mass.

Schmidt & Co., 23 Centre st., N. Y., Consulting Engineers. Machinery designed. Power measured.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

Davis Key-Seating Machines kept in stock by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., N.Y.

Best silk wiping towels for machinery in the market. S. A. Smith, 23 S. Canal st., Chicago, Ill.

Ice and Refrigerating Machines, 131 sold, and all successful. David Boyle, 521 Monroe st., Chicago, Ill.

Iron Planers from 16″ to 36″ wide by any length. H. C. Pease & Co., Worcester, Mass.

Small Model Dynamo Castings, $2.75, $3.75 and $4.75. H. Wellman Mfg. Co., Box 49, Catlettsburg, Ky.

See illustration of Portable Key-Seating Machine in April 4 issue. For further particulars address T. C. Dill Mach. Co., 726 Girard av., Philadelphia, Pa.

The best Emery Wheel made is the "Norwich." For particulars send to Montgomery & Co., 105 Fulton st., New York.

For the latest improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson st., Chicago, Ill.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

For immediate delivery, Fox & Turret lathes, chucks, slide rest, etc. Gage Machine Works, Waterford, N. Y.

Guild & Garrison, Brooklyn, N. Y., manufacture steam pumps, vacuum pumps, vacuum apparatus, air pumps, acid blowers, filter press pumps, etc.

W. H. Hoffman, consulting engineer, 108 Liberty st., room 3, N. Y. Mechanical engineering in all its branches, working drawings for the transmission of power by steam, water, air and electricity.

Contract work of all kinds executed promptly and on reasonable terms. Parties wishing grey iron castings in large quantities can make money by corresponding with Rawson Mfg. Co., Hornellsville, N.Y.

Steam Boilers: Their management and working on land and sea. By Jas. Peattie. Practical facts from 30 years' experience. 230 pages illustrated, 12mo., cloth, $2.00. Circulars and Catalogue of Books for engineers free. E. & F. N. Spon, 12 Cortlandt st., N.Y.

Patterson, Jordan & Gottfried, 146-150 Centre st., N. Y. Metals, Machinery, Hardware, Tools and Supplies for Machinists, Mills, Engineers, Brass Goods Mfrs., Factories, etc. An extensive assortment of Bolts, Screws, Wire, Taps, Drills, etc., carried in stock.

Patent or shop rights for sale, for perforating iron or steel plates for steam boilers, bridge work, iron or steel ship work, marine boiler heads, equal to drilled work and fifteen times quicker. Samples can be seen and circulars obtained from R. E. Dietz, 60 Laight st., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price $2, postpaid. Published by John Wiley & Sons, 15 Astor place, New York.

"Binders" for the AMERICAN MACHINIST. Two styles, the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers, with full page opening flat. Either will hold the entire 52 issues of any volume. AMERICAN MACHINIST PUB'G CO., 96 Fulton st., New York.

"Practical Drawing." By J. G. A. Meyer. The above series of articles, now running in the AMERICAN MACHINIST, should be closely followed by every student. They commenced with October 23, 1886 issue, and up to and including May 23, 1889 issue, 77 articles have been so far published. Copies containing these articles sent by mail to any part of this country or Canada at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

"Modern Locomotive Construction." By J. G. A. Meyer. The above series of articles, now running in the AMERICAN MACHINIST, are attracting the attention of railway mechanics all over the world. Commencing with the June 27, 1885 issue, 92 articles have thus far appeared up to and including the May 30, 1889 issue. Copies containing these articles sent by mail to any part of the U. S. or Canada, at 5 cents each. AMERICAN MACHINIST PUBLISHING CO., 96 Fulton st., New York.

MANUFACTURES

At New Berne, N. C., Warren Ellis will erect a saw and shingle mill.

The Allentown Hardware Co. have been chartered at Allentown, Pa.

A saw mill will be erected at Spartanburg, S. C., by Edwin McDowell.

T. C. Yates is interested in a proposed woodenware factory, at Ashville, Ala.

New shops will be built at Worcester, Mass., by the Stewart Boiler Works.

At Hillsville, Ala., a machine and boiler shop has been built by Kinser & Rogers.

At Pensacola, Fla., W. F. & J. E. Cleary will add a foundry to their machine shop.

W. B. Snead & Co. have contracted to build new machine shops at Lynchburg, Va.

At Ashville, Ala., Alexander Corn, of Whitney, will erect a saw and planing mill.

An iron foundry will be built at Opelika, Ala., by J. B. Bennett and W. Thompson.

A hardware factory will be erected at Jackson, Tenn., by the Jackson Specialty Co.

The recently burned saw mill of E. M. C. Dowling & Bro., at Azark, Ark., will be rebuilt.

Worth Stickley, of Madisonville, Tenn., contemplates the erection of a furniture factory.

At Winchester, Va., the Winchester Gas Co. are thinking of adding an ice factory to their plant.

A machine shop will be erected at Apopka, Fla., by the Apopka & Clay Springs Railroad Co.

A company has been incorporated which will erect a wood-working factory at Archdale, N. C.

At Pueblo, Colorado, Starns, Rogers & Co. are about to establish a foundry and machine works.

At Ansonia, Conn., the Farrell Foundry and Machine Shop will build a large addition to its works.

At Manchester, N. H., new machinery is being put into the bleachery of the Manchester Print Works.

B. K. Collier is interested in a new cotton mill of 10,000 spindles, which is to be erected at Opelika, Ala.

At Buffalo, N. Y., the American Steel Forge Co. has been incorporated, with a capital stock of $500,000.

At St. Augustine, Fla., the St. Augustine Improvement Co. will erect a wood-working shop 60x100 feet.

A company which W. F. Repass has organized, will erect a large furniture factory at Knoxville, Tenn.

A boiler shop will be built in Chicago by John Gubbins, proprietor of the Excelsior Machine Works.

McCrosky & Whittingham are reported to be removing their brass works from Cleveland, Ohio, to Atlanta, Ga.

A saw mill with planing machinery will be established at Palatka, Fla., by W. J. Tilghman & Sons, of St. Francis.

The capital stock of the Simonds Rolling Machine Co., at Fitchburg, Mass., has been increased from $400,000 to $600,000.

The Gracy Lubricating & Machinery Co., of St. Louis, has filed articles of incorporation, with a capital stock of $25,000.

The Everett Woolen Company, of Great Barrington, Mass., has arranged to give its employes a half holiday every Saturday.

It is expected that the Athens Mining & Manufacturing Co. will erect a cotton mill of 5,000 spindles capacity at Athens, Tenn.

Mr. W. M. Smith, of Batavia, N. Y., is organizing a company at Columbus, Ohio, to manufacture a patent vehicle wheel of his invention.

The contract has been let for steel rails for the Anniston & Montgomery Railroad, which is to run from Anniston to Montgomery, Ala.

Mr. Ed. Swindall, of Bainbridge, Ga., has purchased an engine and boiler, and will put in machinery for a shingle, lath and planing mill.

A site for a lumber yard and planing mill has been purchased by the Gregory-Coe Lumber Co., and the Chilton Lumber Co., of Chilton, Ala.

The Glenmore Iron Co., which has acquired title to 3,000 acres of mineral lands near White Sulphur Springs, W. Va., will erect a large plant thereon.

At Birmingham, Ala., the Mary Lee Coal and Iron Co. are building an extension of a railroad, and will soon erect a machine shop, roundhouse, etc.

At Columbia, Ala., the Columbia Variety Works will soon build a two-story brick shop. They are putting in new tools, and expect to add a new foundry.

The Poitevant & Faire Lumber Co., at Pearlington, Miss., whose mill was recently destroyed by fire, will rebuild at once, putting in entirely new machinery.

The Eclipse Wind Engine Co., Beloit, Wis., have issued a folding pamphlet giving all particulars and dimensions of their friction clutch pulleys, hangers, shafting, etc.

The Cleveland Rolling Mill Co., at Cleveland, Ohio, are busy filling orders for forgings for the new Government vessels which are being built on the eastern coast.

W. A. Chesterman, of Richmond, Va., has been awarded a contract to build an addition to the machine shops of the Richmond & Allegheny Railroad, in Richmond.

New water-works or extensions of present systems are talked of at Florence, Ala.; Mammoth Springs, Ark.; Americus, Ga.; Fort Valley, Ga.; Knoxville, Tenn.; Batesville, Ark.; Two Harbors, Minn.

The Michigan Land Co., of Harrison, Mich., contemplate the establishment of a lumber mill at Evergreen, Ala. They own 65,000 acres of timber land in that vicinity.

The Marietta Foundry, of Marietta, Pa., has been merged into the Marietta Casting Co. New buildings are being erected, and will be equipped with the best machinery.

There is a probability that the car shops of the Louisville & Nashville Railroad Company, at New Decatur, Ala., will be enlarged this fall, and will then give employment to about 1,000 men.

The Van Winkle Machine Works, at Atlanta, Ga., which were destroyed by fire some time since, have been rebuilt upon a larger scale, and are now said to be the largest works of the kind in the South.

Huston & Sons, of Coatsville, Pa., have given the contract for a large steel mill to be erected south of their present plant. It will be entirely of iron, and equipped with the latest improved machinery.

At Findlay, Ohio, the plant of the Kellogg Seamless Tube Co. was recently started, and the process put to a practical test. The results were so successful that an enlargement of the works has been ordered.

Some Northern iron men, acting in conjunction with English capitalists, will erect four blast furnaces and steel mills at Cumberland Gap, Tenn., 60 miles north of Knoxville. Three thousand men will be employed.

A building for a machine shop, to be run in connection with the Lagrange Cotton Mills at Lagrange, Ga., has been commenced by the contractor. It will be 40x150 feet. A foundry will also be built, 40x42 feet.

We have received from the Pond Engineering Co., St. Louis, Mo., a new pamphlet devoted to a description of and general information regarding the Lowe feed water heater and purifier. It is sent to any one interested upon application.

The Laborers' Manufacturing Co., of Meridian, Miss., has been chartered by J. E. Platt and others. They will manufacture materials for house builders, wagons, etc. It is proposed to organize the company on the co-operative plan, paying up the stock in monthly payments of $1.

The Campbell Printing Press and Manufacturing Co., of New York city, have issued a special catalogue of their oscillator printing presses. The catalogue is printed in two colors upon one of the presses illustrated, and affords ample evidence that first-class work can be done by them.

Henry R. Worthington is at present having a very large export trade in pumps, having shipped within the six months past about 1,000 of the smaller sizes to foreign countries, principally England and France. They are now building, at the factory in Brooklyn, 300 to 450 pumps per month.

We have received from the Charles River Iron Works (Edw. Kindall & Sons) Cambridgeport, Mass., a well-illustrated and well-bound catalogue, describing the line of machine work manufactured by them, which consists of portable, stationary and hoisting engines, and general machine work, steam boilers, etc.

We have received the illustrated catalogue of the Putnam Machine Company as consolidated with the Putnam Tool Company, Fitchburg, Mass. It is an unusually large and complete one, and the illustrations, typographic work, and general execution are first-class. Some of the tools are illustrated by reproductions of working drawings, and show the construction very clearly.

Evans & Howard, of St. Louis, Mo., have issued a new and well illustrated catalogue of their fire-brick and special shapes for all kinds of furnaces, cupolas, gas retorts, iron and brick stack linings, locomotive arch tiles. The shapes, with their method of application, are illustrated mostly by reproduction of working drawings, and the catalogue will be found useful to manufacturers.

The Botany Company has paid for the land in Passaic City, purchased of the Dundee and Equitable Land Companies, and settled the dispute between the Erie and Susquehanna Railroads by declaring that it must own and control all tracks on the property. The class of goods to be made at its mills is not manufactured in this country at all now. The company runs 80,000 spindles in Germany, and will start with 16,000 here.—*Boston Journal of Commerce.*

The Holyoke Machine Company, Worcester, is making extensive improvements at the old Wheeler foundry recently purchased by it. New buildings are to be put up, one of them being a brick building four stories high, 75x75 feet, for a pattern room, and an additional one 75x150, to be used as a foundry. This will be equipped with new machinery, and will be a great convenience to the company in facilitating its growing business.—*Manufacturers' Gazette.*

The Baldwin Locomotive Works, of this city, has just ended negotiations with the Roanoke Rolling Mill, of Roanoke, Va., for the purchase of 200 tons of bar iron. The price at which the sale was conducted is not given, but it is understood to be below the price ruling for Pennsylvania iron. Ever since the Baldwin Works were established, manufactured iron has been purchased in Pennsylvania, and it is intimated that the only reason the Roanoke iron is taken this time is because of its lower price. This sale is said to be the first transaction in Southern manufactured iron consummated in this State.—*Philadelphia Inquirer.*

Machinists' Supplies and Iron.

NEW YORK, June 15, 1889.

Iron—American Pig.—The firmness of the general tone of the market has increased, and a better feeling prevails, though there is still a disposition amongst consumers to provide for requirements which are either covered by contracts, or otherwise made practically certain. We quote Standard Northern brands, No 1 X Foundry, $17 to $17.50; No. 2, $15.75 to $16; Southern brands, No. 1, $16 to $16.50; No. 2, $15 to $15.25; Grey Forge, $14.50 to $15.25.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Wanted—Position by practical mach. and draftsman as supt. or asst. Tubular, AM. MACHINIST.

Wanted—A mechanical engineer, one accustomed to making working drawings of small machinery. Address The National Cash Register Co., Dayton, O.

Wanted—A competent, practical and pushing foreman for general machine shop. Address, giving experience and reference, D. H. C., AM. MACHINIST.

Wanted—A position by a practical, experienced foundry foreman, at present holding the same position; can give the best of reference as to ability. Address W. D. S., AMERICAN MACHINIST.

Wanted—Situation as foreman by an experienced pattern maker and draftsman well up in the work. Eng. and general machinery; Western location preferred. "Machinery, B.," AMERICAN MACHINIST.

Wanted—A superintendent for a factory in Ontario, making binders, mowers and horse rakes, and employing 250 hands; must be able to give out piece-work, order stock, and thoroughly acquainted with the interchangeable system and the management of men. BOX 103, AMERICAN MACHINIST.

Wanted—Position by a man with over 20 years' experience in the mach'y and supply business, both on the road traveling and in the office; would like to represent some mfg., and would travel or stay in office or store; large acquaintance; best references. Lawrence, AMERICAN MACHINIST.

✢ MISCELLANEOUS WANTS ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Just out; aluminum-steel hack-saws, hard but not brittle. Crescent Mfg. Co., Cleveland, O.

New catalogue of engineers' specialties free. Crescent Mfg. Co., Cleveland, O.

Steel Name Stamps, Copper Burning Brands, etc. W. G. Sackmann, 1099 First av., Cleveland, Ohio.

Light and fine machinery to order; Foot Lathe. Catalogue for stamp. E. O. Chase, Newark, N. J.

August C. Christensen, 24 State st., N. Y., Consulting Engineer. Designs of all kinds of Machinery.

Turned and Highly Polished Iron and Steel Shafting a specialty. Merwin McKaig, Cumberland, Md.

Model Engine Castings for sale. Send for circular. Lowell Model Co., 170 Merrimack st., Lowell, Mass.

Engineers wanted to send their addresses and receive free a 25 cent book, "Hints and Suggestions for Steam Users." Lord & Co., P. O. Box 1262, Phila., Pa.

Wanted—Second-hand roll lathe; please send description, age, weight, price and location to "Roll Lathe," care AMERICAN MACHINIST.

Wanted—By a reliable foundry and machine company a few specialties to manufacture; patented articles preferred. F. & M. Co., AM. MACHINIST.

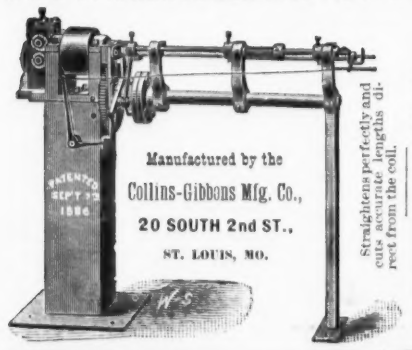
Wanted—To buy second-hand lathes, planers and shapers of all sizes; must be cheap and in good order. Fosdick & Plucker, 6th and Culvert Streets, Cincinnati, O.

How to remove and prevent scale in steam boilers at a cost of ten cents a week. Send postal for circular to Pittsburgh Boiler Scale Resolvent Co., Pittsburgh, Pa.

Machine Shop to let, Rent 40 dollars per month, including power and gas, with use of tools. 3 lathes, planer, shaper, milling machine, drill-press, forge, etc. 57 John st., New York.

For sale to close business. Engines, boilers, pumps, tanks, blowers, lathes, drill, 30" Hepworth Extractor, lot cylinder boilers for stacks, all tools and fixtures. Christian Hoffman, 225 Water st., Brooklyn, N. Y.

—AUTOMATIC—
WIRE STRAIGHTENER AND CUTTER.



Straightens perfectly and cuts accurate lengths direct from the coil.

Wire straightened and cut to order

WANTED: Machinery to build. Specialties in CAST IRON to manufacture. Fine, solid CASTINGS for Dies, Moulds, Dynamos, Motors, &c. MANUFACTURER, P. O. Box 886, New Haven, Conn.

Established 1832. BRADLEY'S POWER HAMMERS
The BEST in the WORLD
RUN BY BELT.

Over 1500 in USE

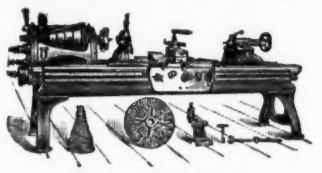
BRADLEY'S HEATING FORGES

Indispensable in all shops to keep BRADLEY'S CUSHIONED HAMMERS and men fully employed and reduce the cost of production.

BRADLEY & CO. SYRACUSE, N.Y.
63 Murray st. NEW YORK; 98 Sudbury st. BOSTON, MASS

SOLID EMERY OIL STONES AND Triple Coated KNIFE SHARPENER
WHOLESALE ONLY BY THE TANITE CO., STROUDSBURG, PA.

Fitchburg Machine Works.
Manufacturers of
METAL-WORKING MACHINES.



OFFICE AND WORKS,
13 to 21 MAIN STREET,
Fitchburg, Mass.
Send for Catalogue (E.)

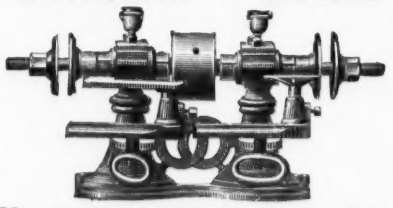
MACHINIST'S SCALES,
PATENT END GRADUATION.
We Invite Comparison for Accuracy with all others.
EVERY SCALE GUARANTEED. SEND FOR LIST.
COFFIN & LEIGHTON, SYRACUSE, N. Y.

MANUFACTORY SHEFFIELD, ENGLAND.
Chief American Office, 91 JOHN ST., NEW YORK.

WM JESSOP & SONS LTD. BEST TOOL STEEL NEW YORK.

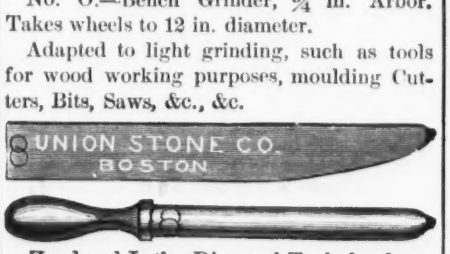
ALL KINDS OF STEEL in STOCK.
IMPORTATION ORDERS PROMPTLY FILLED.

UNION STONE COMPANY,
38 & 40 HAWLEY ST., BOSTON, MASS.
36 JOHN ST., NEW YORK.



No. O.—Bench Grinder, ¾ in. Arbor. Takes wheels to 12 in. diameter.

Adapted to light grinding, such as tools for wood working purposes, moulding Cutters, Bits, Saws, &c., &c.



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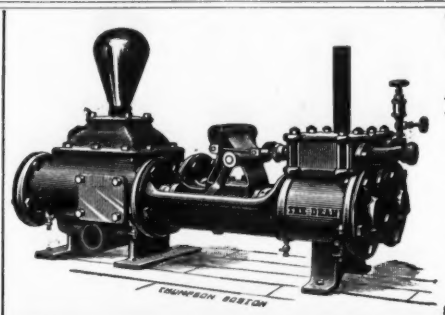

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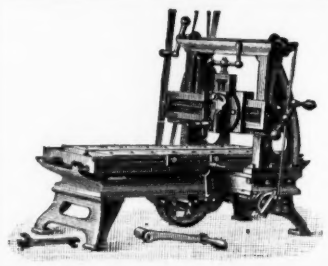

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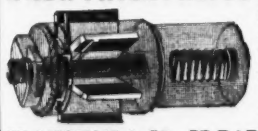

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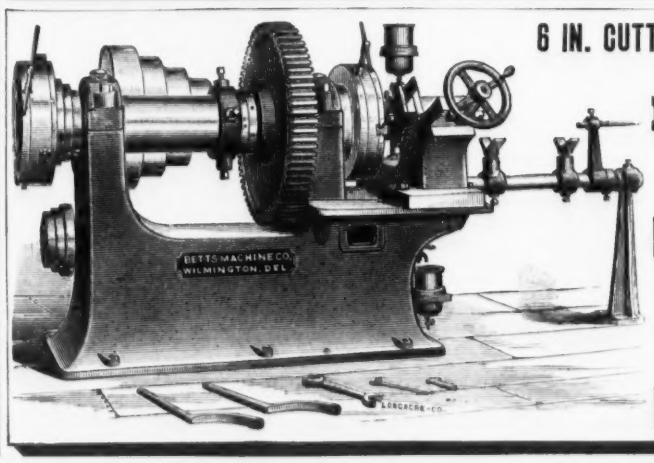

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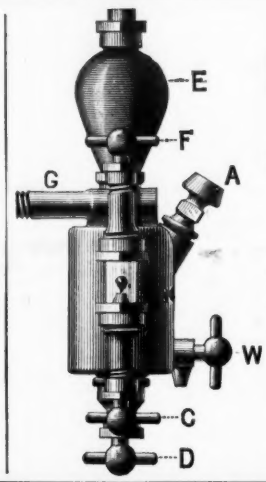

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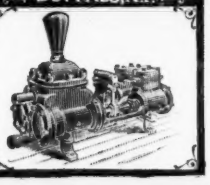

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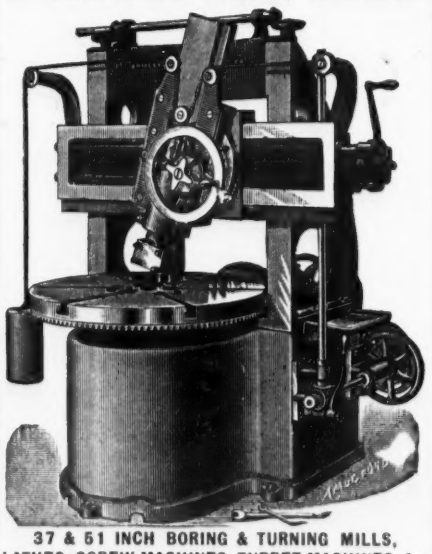

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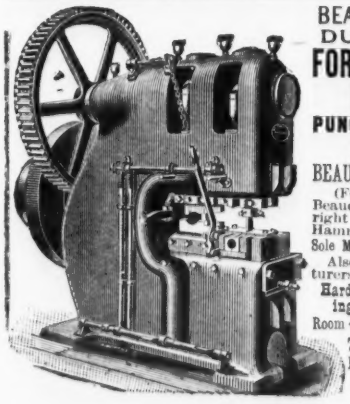

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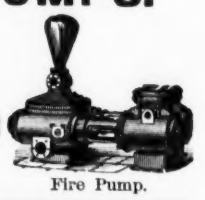

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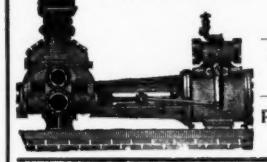

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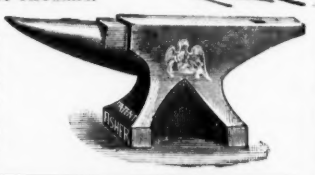

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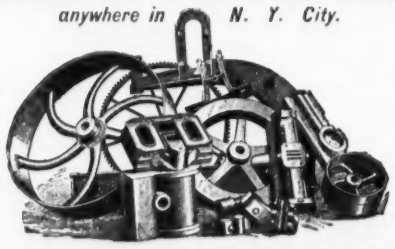

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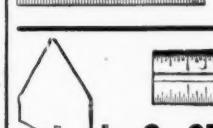

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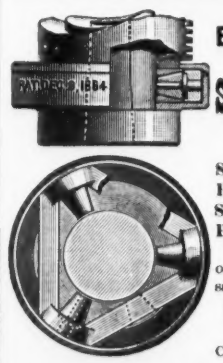

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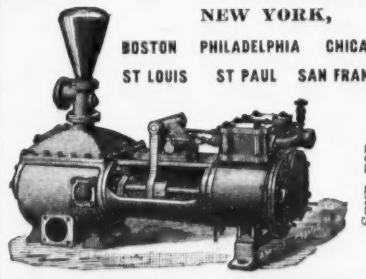

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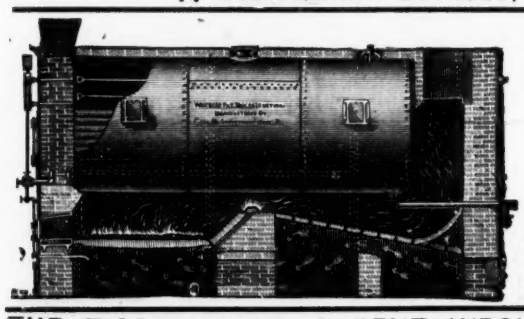

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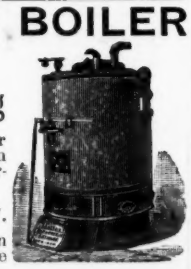

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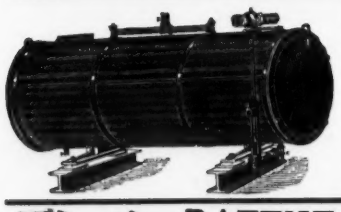

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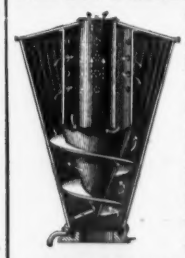

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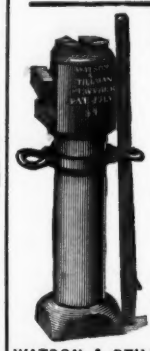

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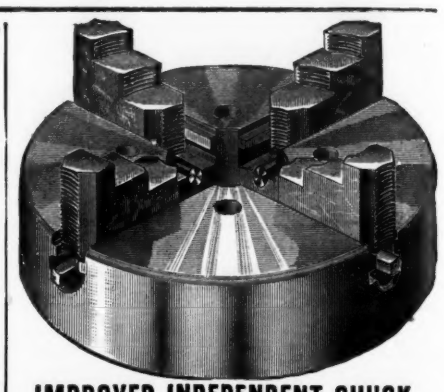

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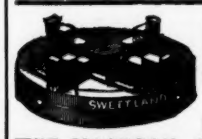

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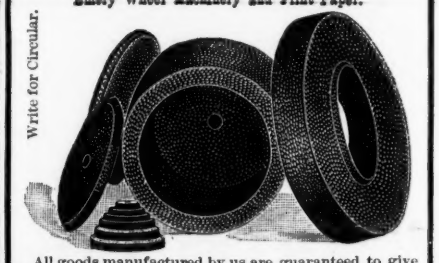

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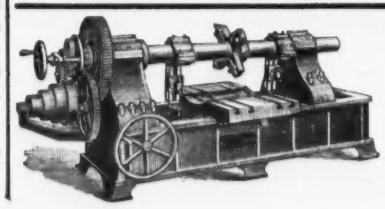

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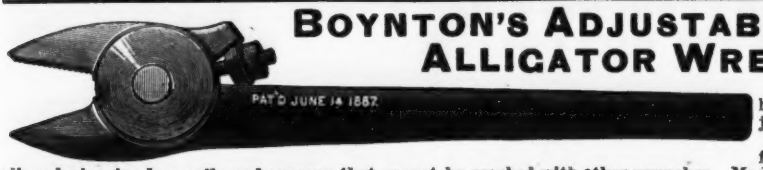

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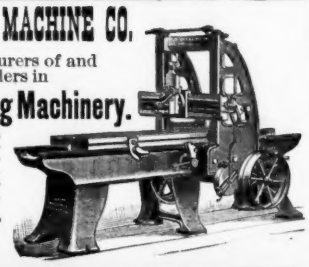

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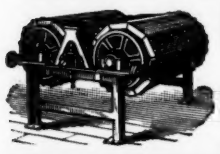

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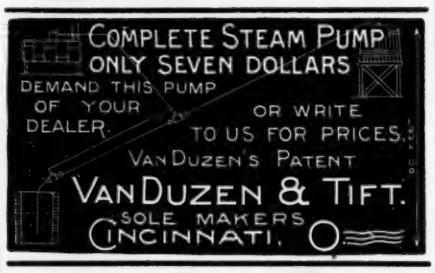

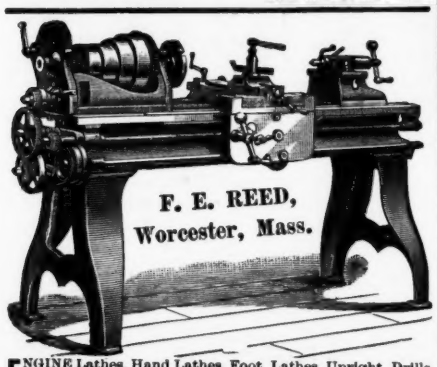

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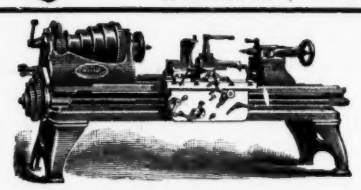

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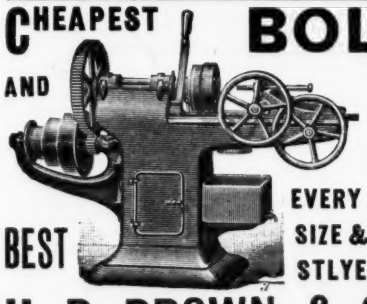

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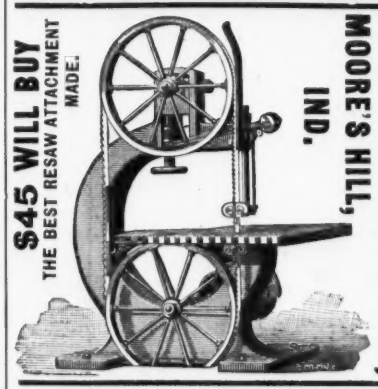

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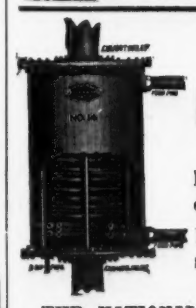

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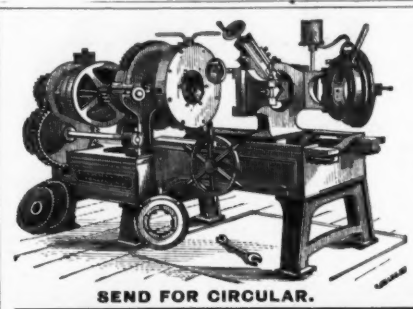

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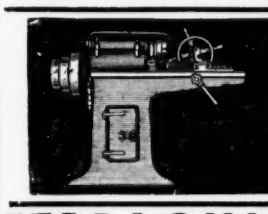

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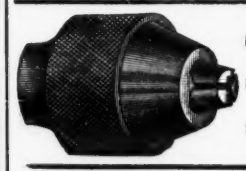

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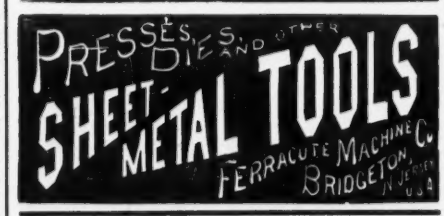

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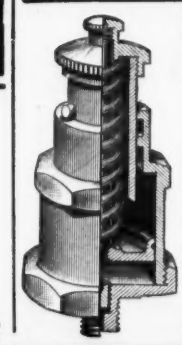

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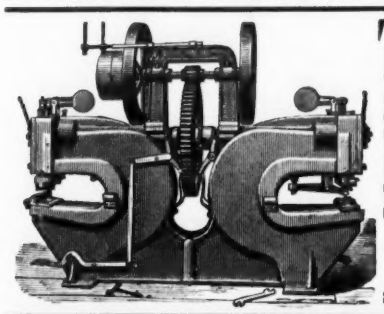

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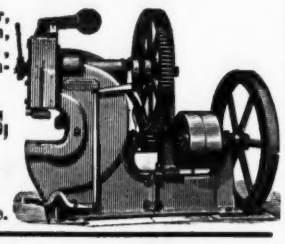

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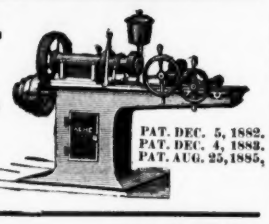
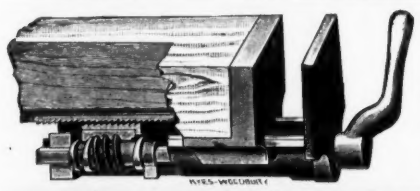


PAT. DEC. 5, 1882.
PAT. DEC. 4, 1883.
PAT. AUG. 25, 1885.



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☞ See Advertisements, pages 15 and 16.

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These machines are in **PERFECT** order and are practically as good as new, and will be sold **LOW** for cash. If you find nothing on above list which meets your wants, write for our **COMPLETE** list of **SECOND-HAND MACHINERY.**
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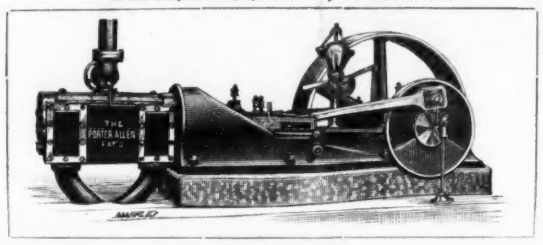

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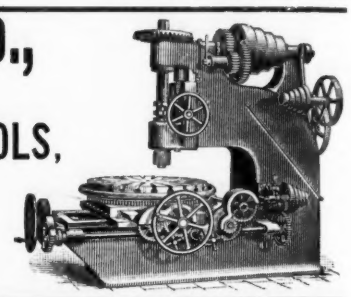

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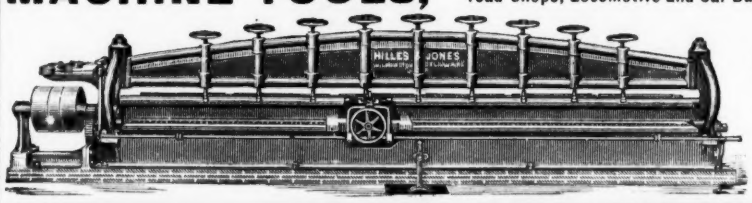

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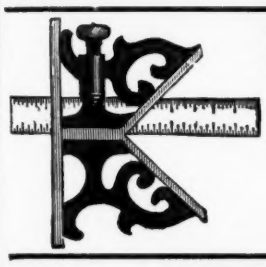

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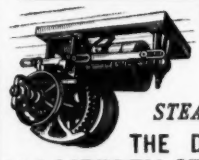

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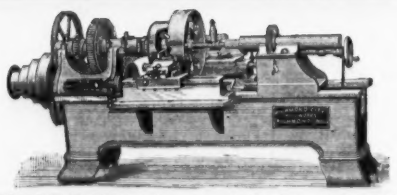

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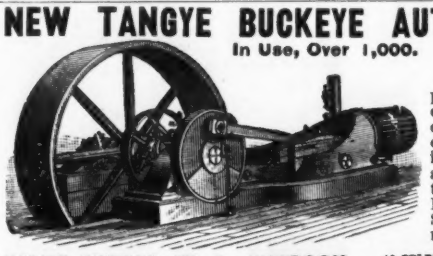

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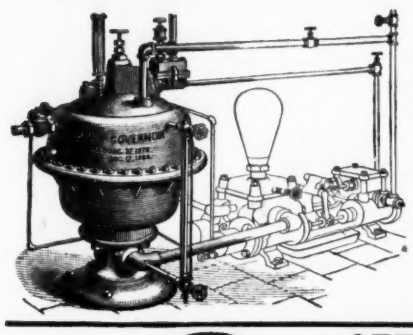

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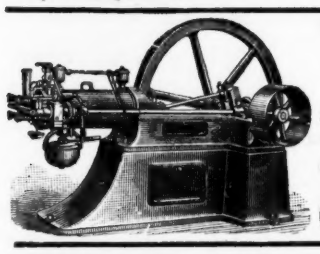

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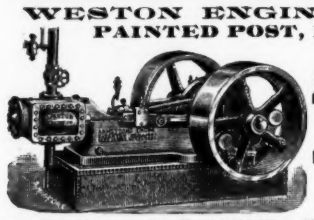

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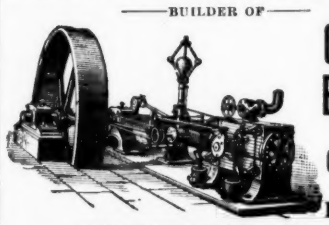

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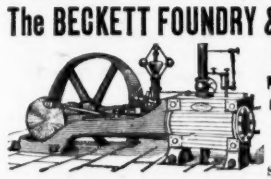

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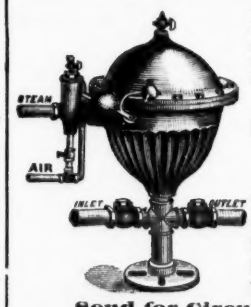

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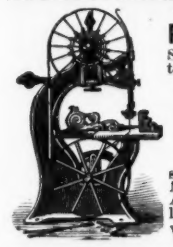
Surfacing, Moulding, Tenoning, Mortising, Boring, and Shaping, etc.



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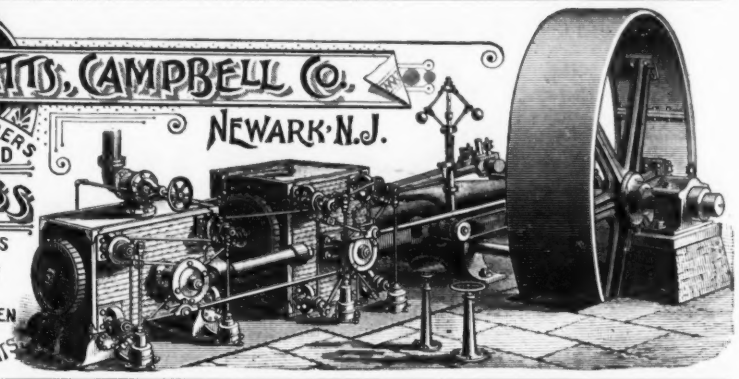

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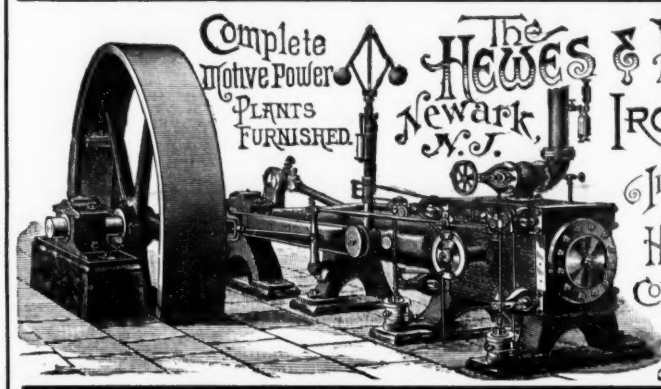

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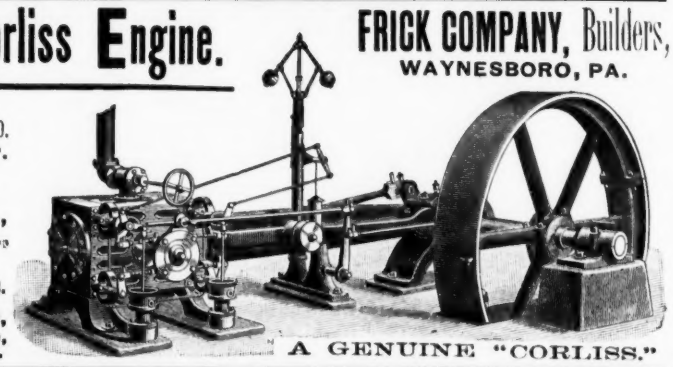

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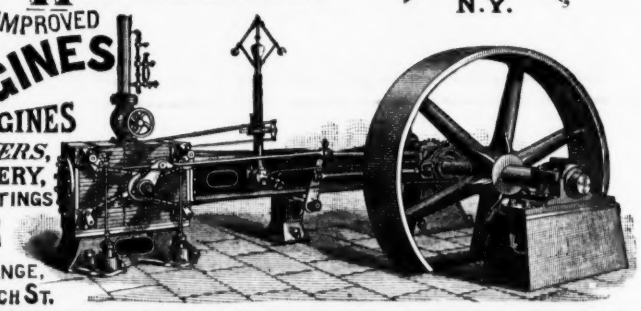

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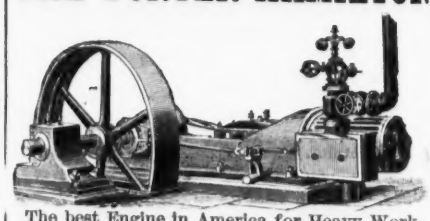

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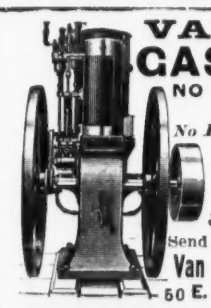

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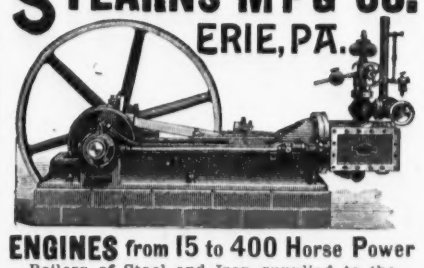
ERIE, PA.



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Boilers of Steel and Iron supplied to the trade or the user. Send for Catalogue.
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SEND FOR SPECIAL PAMPHLET.

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Cooke Locomotive and Machine Co.

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Gentlemen:—Replying to your favor of May 16th, we are very much pleased with the No. 3 Universal Cutter and Reamer Grinder purchased from your Company. It does its work well and gives good satisfaction.

Yours truly, JOHN S. COOKE, *President.*

Poole & Hunt, Founders and Machinists.

BROWN & SHARPE MFG. CO., Providence, R. I. BALTIMORE, MD., May 14, 1888.

Gentlemen:—We have had one of your No. 3 Universal Cutter and Reamer Grinders in use in our establishment for nearly five years, and find it a very useful and efficient machine. We consider it a very important part of the outfit of a well-equipped machine shop. We are,

Yours truly, POOLE & HUNT.

The Mergenthaler Printing Co.

BROWN & SHARPE MFG. CO., Providence, R. I. BALTIMORE, MD., May 18, 1888.

Gentlemen:—We have had one of your No. 3 Universal Cutter and Reamer Grinders in use in our works since February, 1887, and find it a very useful and valuable addition to the list of modern improved tools for machinists' use. Its simplicity, wide range of adaptation and economy of time in use, commend it very strongly to progressive men in our line of business.

Yours truly, THE MERGENTHALER PRINTING CO.

Whitely, Fassler & Kelly, Proprietors Champion Harvesting Machine Works.

BROWN & SHARPE MFG. CO., Providence, R. I. SPRINGFIELD, OHIO, U. S. A., June 1, 1888.

Gentlemen:—We have used one of your No. 3 Universal Cutter and Reamer Grinders in our factory for quite a while, and we wish to say to you that it is a splendid tool. Its work is entirely satisfactory to us, and we consider it an indispensable tool and could not well do without it, and we cheerfully recommend it to the public. Yours truly,

JAMES A. DICUS, *Superintendent.*

The Warder, Bushnell & Glessner Co.

BROWN & SHARPE MFG. CO., Providence, R. I. SPRINGFIELD, OHIO, May 18, 1888.

Gentlemen:—Replying to your favor of the 16th inst., would say that the No. 3 Universal Cutter and Reamer Grinder we purchased from you nearly four years ago is giving us the very best of satisfaction. We have a number of different tool grinding machines for Cutters, Mills, etc., but your No. 3 Cutter and Reamer Grinder is the most conveniently arranged, and is applicable for grinding all kinds and styles of milling cutters. We have not yet found a cutter that this machine could not grind and make a perfect job of it. Yours truly, THE WARDER, BUSHNELL & GLESSNER CO.

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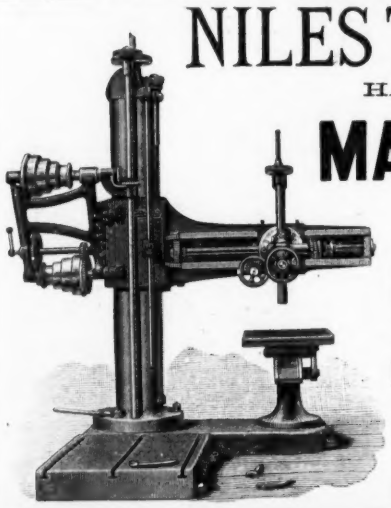
NILES TOOL WORKS,

HAMILTON, OHIO.



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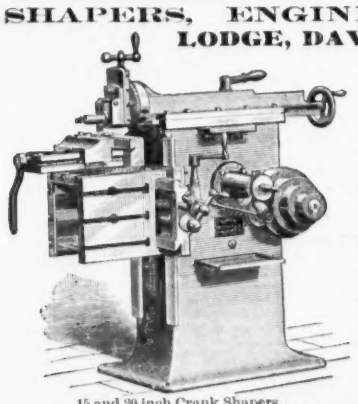

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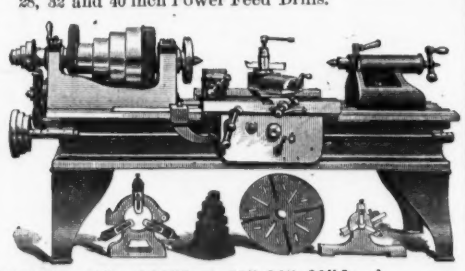

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ENGINE LATHES, 17", 19", 21", 24", 27", and 38".
(See advertisement, page 15.)

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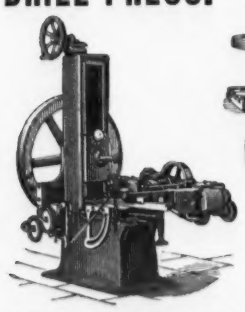

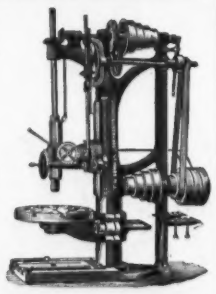

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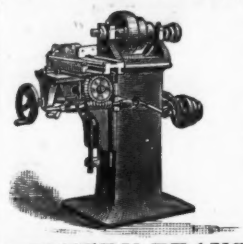

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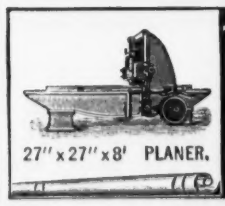

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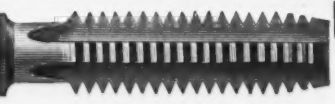

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